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Editorial

The Twenty-third Annual Convention of the All India Food Preservers' Association was held from 4th to 6th March in picturesque Shillong, capital of Assam. The place was well chosen as it offers one of the highest potentials for the development of fruit and vegetable processing industry. The region has tropical as well as sub-tropical climate suitable for growing tropical and deciduous fruits. It is necessary that a well organised industry is developed in the region. This will go a long way to contribute not only towards self-sufficiency of the State but also for making on the spot supplies to the Defence Services in time of emergency. It was indeed gratifying that the Hon'ble Chief Minister, Shri B. P. Chaliha took very keen interest in the development of this industry and in his inaugural address promised all possible help and assistance.

The Conference discussed some of the major problems which the industry had to face during 1965. There has never been such acute shortage of tinplate as in the past year. Shortage of foreign exchange made it almost impossible to obtain the requirements of tinplate for the civilian requirements. This set out a vicious circle of loss of production, spiralling of prices and lot of inconvenience to the consumers. If the tinplate is not supplied immediately the production will go down and the industry will suffer heavy losses. It is indeed encouraging to note that the Hindustan Steel Limited, Rourkela, are making rapid strides to develop the required quality of tinplate indigenously and meet the entire requirements of the industry. They have initially released 200 tonnes of the tinplate to the Agricultural Marketing Adviser to the Government of India for allotment to the industry. We are sure the tinplate will prove very successful in all aspects. Until such tinplate is made available in sufficient quantity, Government should give high priority to the industry to permit import of tinplate. This year the Green Peas crop was good but canners could not take advantage due to non-availability of containers. It is indeed most regrettable that this should happen at a time when the country is passing through an acute food shortage. The coming Mango crop is quite large and will require atleast 1000 tonnes of tinplate for processing. Several of the canners have made export commitments which must be honoured. Once the export market is lost, it will be difficult to make a re-entry. The importers' confidence will be lost and India's reputation will receive a set back.

Other important points discussed at the Conference included the need for enhanced training facilities to improve quality control and management, market studies abroad, free supplies of essential chemicals, additives and enrichments, increased import entitlements against foreign exchange earning, allotment of sugar directly from the centre and concession in ocean and railway freights. Each point was discussed in detail. Resolutions were passed to be followed up with the concerned department of the Government of India with the hope that in the mutual interest every possible facility will be provided to the industry.

ASSOCIATION OF FOOD TECHNOLOGISTS

(INDIA)

CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE MYSORE

(A professional and educational organization of Food Scientists and Technologists)

AFFILIATED TO THE INSTITUTE OF FOOD TECHNOLOGISTS, USA

Objects:

1. To stimulate scientific and technological research on various aspects of Food Technology.

2. To provide a medium for the exchange, discussion and dissemination of current developments in the field of Food Science and Technology.

3. To promote the profession of Food Technology.

The ultimate object is to serve humanity through better food.

Major Activities:

1. Publication of the Journal of Food Science and Technology—a quarterly.

2. Publication of authoritative critical reviews by specialists in different branches of Food Science and Technology.

3. Arranging lectures for the benefit of members.

4. Holding symposia on different aspects of Food Technology.

Membership:

Membership is open to graduates and diploma holders in Food Science and Technology, and also to others interested in Food Science and Technology and allied fields. Regional branches of the Association are being established.

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For membership and other details, kindly address:

THE HONORARY EXECUTIVE SECRETARY
ASSOCIATION OF FOOD TECHNOLOGISTS, C.F.T.R.I., MYSORE-2, INDIA

THE TWENTY-THIRD ANNUAL CONFERENCE

The twenty-third Annual General Meeting of the Association was held in the picturesque Shillong, capital of Assam and Headquarters of United Khasi and Jaintia Hill districts. The Reception Committee headed by Shri Stanley Nicholas Roy of United Fruit Co. had made elaborate arrangements for the Conference and comfortable stay of the participants.

Friday, 4th March, 1966: 4.30 p.m.

The outgoing members of the Executive Committee met in Shri K. U. Patel's room in Hotel Pinewood. It was decided to present Kashalkar Memorial Award for the year 1965 to Mr G. S. Little John, Research Manager, The Metal Box Company of India Ltd., Calcutta, for the outstanding service rendered by him to the Industry over a period of 10 years.

Saturday, 5th March, 1966: 9.00 a.m.

The inaugural session started at the Central State Library Hall. Shri B. P. Chaliha, Chief Minister of Assam, arrived in time and was received by the President and members of the Reception Committee. It was very encouraging to note that the honourable Chief Minister spared valuable time to inaugurate the Conference in spite of his pre-occupation in view of the present unsatisfactory conditions.

The Hall was packed to capacity. The attendance at the Conference was one of the best held so far. One could see delegates with full enthusiasm. Everybody was keen at the outcome of the Conference because of the serious raw material shortages facing the industry particularly tinplate and sugar. There could be seen representatives of food processing industry from all over the country. The packaging and container fabricating industry responded very encouragingly to the Association's request by deputing members, Board of Directors and representatives from Sales, Research and Development Departments. There were scientists and development officers from the Central Food Technological



A section of the audience at the 23rd Annual Conference

Research Institute and Defence Research Laboratories; Regional Research Laboratory, Council of Scientific and Industrial Research, Jorhat; Directorate of Marketing and Inspection; Development Wing, Ministry of Commerce; Processed Foods Export Promotion Council; Hindustan Steel Ltd., Rourkela; and officers from the Central and State Governments. One could also see the new members who joined the Association attending the Conference with fresh vigour and vitality.

The programme of the Conference was very well laid out. The deliberations began with a welcome address by Shri Stanley Nicholas Roy. This was followed by the Presidential address delivered by Shri K. U. Patel.



Shri B. P. Chaliha, Chief Minister, Assam, inaugurating the Conference

Honourable Chief Minister, Shri B. P. Chaliha inaugurated the Conference. He extended a very hearty welcome to all the participants on behalf of himself, Shri Nicholas Roy and the people of Assam. He pointed out that the country is faced with economical problems. He agreed with the President who laid out with convincing arguments, the achievements, and requirements of Fruit and Vegetable Preservation Industry in the country. He recommended that suggestions of the President should be accepted and requested for due consideration by the Government of India. He assured his personal help and assistance. Assam has enormous facilities for the development of horticulture and fruit utilization. He appealed to the scientists, technologists and industrialists to utilize the facilities available in the State. He appreciated the efforts put up by a family in Assam to set up fruit processing units for the utilization of Fruits and Vegetables grown in the State. He said, being a layman, he cannot give any technical help and guidance to the participants but emphasised that sustained efforts and regular attention always go a long way in solving problems facing any industry. He felt sure that the problems will be discussed in detail, and the Convention will come out with definite decisions and recommendations for the progress of the industry. He once again welcomed all and with these words he inaugurated the Convention.

The Hon'ble Chief Minister presented the Kashalkar Memorial Award to Mr G. S. Little John, Research Manager, The Metal Box Company of India Limited, Calcutta.

Mr S. Ramaswamy, Development Officer, Directorate of Oil and Vegetable, Ministry of Commerce, addressing the Conference conveyed heartfelt thanks to Shri B. P. Chaliha to have accepted our invitation at the emergent moment to inaugurate the Conference. He clarified the position regarding the availability of tinplate and essential raw materials and promised all possible help and assistance for the progress of the industry. He informed that efforts are being made to import pectin under Danish credit for distribution to the Industry. There are difficulties of foreign exchange well known to everybody. Defence has to be given priority on account of obvious reasons. Tinplate under Dutch credit is expected shortly for release for civilian use



Shri R. Ranjit Rai, M/s. Rai & Sons Pvt. Ltd., hosted a Cocktail party at his Shillong Office L to R. Mrs. Goyle, Mr. S. Mordecai, Mrs. Sardeshpande, M/s. Ranjit Rai, K. U. Patel, B. B. Sardeshpande, Mrs. Patel and Mr. R. N. Goyle.



Shri N. N. Kapadia, Director, Poysha Industrial Company Limited, Bombay, gave a Lunch at Hotel Pinewood on 6th March—L to R. Mrs. Rama Iyengar, Mrs. Goenka, Mrs. Mehta, Mrs. Kapadia, Mrs. Patel, Mrs. Sardeshpande and Mrs. Trivedi.



At the Association Lunch—L to R. Dr B. L. Amla, M/s. B. B. Sardeshpande and T. M. Rama Iyengar.



L to R. M/s. N. N. Kapadia and K. U. Patel.



At Tea given by Shri S. Nicholas Roy, United Fruit Co. Ltd., Shillong—L to R. M/s. Mordecai, T. M. Rama Iyengar, Dr D. S. Bhatia, M/s. D. P. Dass, K. U. Patel, Mrs Goenka, Mr Little John, Mrs Trivedi and Mr Goyle.

and export. Also credit is almost finalised to import 1.00 lb. coating electrolytic tinplate from Poland. Efforts are being made to import tinplate from the USSR under rupee payment. He requested all the participants to take maximum benefit of the three tier scheme introduced recently to offset the costs and help in the promotion of exports.

Mr T. M. Rama Iyengar, Chief Commercial Manager, Metal Box Company of India Limited, Calcutta, sympathised with the members of the Association on account of acute shortage of tinplate, the basic packaging material for a large number of items. He shared the views of the Association and requested the Government to give due consideration. He emphasised that there will be no delay in the fabrication and supply of containers as soon as the tinplate is released by the Chief Director of Purchase, Agricultural Marketing Adviser to the Government of India, Processed Foods Export Promotion Council, or any other Government authority. He called upon the industry to take constructive measures for the horticultural development as the progress of this industry is directly related to this aspect. The implication of this according to him is not being fully realised.

Mr N. N. Kapadia, Director, Poysha Industrial Company Limited, Bombay, requested to revive Barter agreements with Japan, Germany and USSR which were shelved on account of national emergency when Pakistan attacked our country. He stated that most of the cases are being reopened by the Government and import of tinplate should also be given favourable consideration. He informed the house that the container fabrication industry is at present not utilizing its full capacity. According to him a few more firms have been licenced for the manufacture of open top sanitary cans. He suggested that instead of giving new licences the productivity and operational cost in the existing units should be encouraged to reduce the cost of containers.

Mr M. I. David, Canning Industries (Cochin) Limited, Trichur, very emphatically put up the case for the Pineapple industry in South India. This is the only fruit processing industry in the country which has close collaboration with the grower. As a matter of fact, the growers are partners in processing units. According to him, much has been said in various meetings but nothing has been done. The plantation of Pineapple in Trichur has been extended considerably and the present annual harvest is around 6,000 tonnes. This is attributed to the development of canning industry which utilises the entire crop at a reasonable price. If the non-availability of tinplate continues for a long period, the plantations of Pineapple may disappear and it may take sustained efforts of years to revive the position.

Mr A. N. Sen, Hindustan Steel Limited, Rourkela, said they will be extremely happy to help the industry with as much tinplate as possible under the present capacity of the plant. They have carried out tests in Rourkela and are very keen to improve the chemical composition of the plate so as to conform to world standards. They have released 500 tonnes hot dipped tinplate for trials. They are experiencing difficulty in getting tin ingots. He requested that the Conference should recommend to the Government for more allotment of tin ingots to Hindustan Steel Limited. The production of electrolytic tinplate is included in the expansion programme and the installation work is in progress.

Dr G. S. Siddappa stated that the Rourkela tinplate has been tested at the Central Food Technological Research Institute, Mysore, against imported tinplate. He assured the house that the cans made from Rourkela tinplate are satisfactory and he adviced the canners to encourage the use of the indigenous tinplate.

The results of initial experiments on the processing of fruits in cans made from this tinplate are very encouraging. A detailed plan of further experiments has been drawn up. Dr Siddappa also confirmed full support of scientists from the Central Food Technological Research Institute in solving various technological problems confronted by the industry.

Mr G. S. Little John, recipient of Kashalkar award for 1965, brought a note of caution that phosphorus content in Rourkela tinplate is on the high side, which may result in hydrogen swell spoilage. He was of the opinion that the Rourkela tinplate is suitable for non-corrosive packs. They in Metal Box Co. have also organised large scale packing trials which are in progress.

Mr Sardeshpande expressed concern over the complete ban on the import of citric acid from the free currency areas. Licences have been issued on USSR. The price of citric acid in USSR is almost double and the quality is not suitable. Exporters from USSR offer only edible quality citric acid against B.P. quality which is generally the accepted standard. He cautioned that before the issue of such licences the quality should be tested.

Mr Nicholas Roy reiterated that we should take up our problems at all levels including political level. He suggested that a resume of the proceedings should be sent to the Development Council. Everybody is sympathetic to the industry but only in words. The importance of this industry to the agricultural and horticultural development has not been properly spelled out and implemented. He requested that the Agricultural Marketing Adviser, the Chief Director of Purchase and Government authorities to listen to the hardships the industry is facing today. It is high time that we should take up the matter with the Central Government at a much higher level.

Mr B. S. Srinivasan, Secretary, Processed Foods Export Promotion Council, New Delhi, assured that everything is being done to allot tinplate for packing processed foods for export. He assured the house that he will not allow exports to suffer on account of shortage of tinplate.

In the afternoon session, the Hon. Secretary read the minutes of the last meeting and presented the Annual Report and the Audited Accounts which were adopted unanimously. It was agreed that efforts should be made to increase the membership of the Association.

The President announced that the next item on agenda was the election of the office bearers and members of the executive committee for 1966. Since there was only one nomination for each post the elections were unanimous:

Chairman	Shri Vittal Mallya, Kissan Products Ltd., Bangalore
President	Shri K. U. Patel, Tims Products Ltd., Calcutta
Vice President	Dr D. S. Patel, Pure Products and Madhu Canning Ltd., Bombay
Hon. Secretary	Shri S. H. Mehta, Farm and Fruit Products, Calcutta

Members of the Executive Committee, including co-opted members.

West Zone:	Shri B. B. Sardeshpande, Corn Products Company Pvt. Ltd., Bombay
	Shri P. H. Bhatt, Kaira Dist. Co-Op. Milk Producers' Union Ltd., Anand
East Zone:	Shri S. N. Mitra, Mida & Co. Pvt. Ltd., Calcutta
	Shri S. Mordecai, Daw Sen & Co. Pvt. Ltd., Calcutta

North Zone: Shri K. P. Bhargava, G.G. Industries, Haldwani, Agra

Dr H. C. Srivastava, Hindustan Lever Ltd., Ghaziabad, U.P.

Shri R. N. Goyle, Essex Farms Pvt. Ltd., New Delhi

South Zone: Shri M. I. David, The Canning Industries Cochin Ltd., Trichur

Shri Ranjit Rai, Rai & Sons Pvt. Ltd., Hyderabad

Mr V. B. Oberoi, Editor, Indian Food Packer, Kissan Products Ltd., Bangalore.

Dr D. S. Bhatia, Convener, Technical Advisory Committee, The Coca-Cola Export Corporation, New Delhi.

The President and members of the Association gave a luncheon to all the delegates and guests at Hotel Pinewood.

Shri Nicholas Roy gave a Tea Party at Pinewood in the evening. This was followed by a Cocktail party hosted by Shri R. Ranjit Rai at his Shillong office.

Sunday, 6th March, 1966

The meeting of the Technical advisory Committee was held in the Seminar Room, Central State Library Hall at 10.00 Hrs.

Dr G. S. Siddappa, Chairman, Training Programme (National & International), Central Food Technological Research Institute, Mysore, and Convener of the Committee, took the Chair. The proceedings of the meeting are published separately (pages 18-21).

The new Executive Committee met in the room of Shri R. N. Goyle in Hotel Pinewood at 14.30 Hrs.

Shri K. U. Patel commended the work done by Dr G. S. Siddappa as the Convener of the Technical Committee. Under his guidance the technical problems of the industry were given due attention by research workers at the C.F.T.R.I., Mysore. He proposed Dr D. S. Bhatia, Technical Manager, Coca-Cola Export Corporation, to take over as Convener of the Technical Committee of the Association. The proposal was accepted unanimously.

The Venue for the next meeting was decided either at Delhi or Hyderabad. It was left to the discretion of the President to fix the place and time for the next meeting.

Shri N. N. Kapadia, Director, Poysha Industrial Company Limited, Bombay, hosted Lunch at Hotel Pinewood. Shri T. M. Rama Iyengar, Commercial Manager, The Metal Box Co. of India Ltd., gave a Cocktail party at Shillong Club. The dinner was hosted by Shri R. S. Goenka of Frutos Company, Gauhati, at Hotel Pinewood.

We welcome the new members who have joined the Association this year.

1. M/s The Britannia Biscuit Co. Ltd., Executive Office, 'Tiecicon House', 4th Floor, Haines Road, Bombay-11.
2. M/s Tulip Products Co., 37, Imdad Ali Lane, Calcutta-16.
3. M/s P. Venkatachellum Condiments, 1, Broadway, Madras-1.
4. M/s Goa Food Products Pvt. Ltd., Chowgule House, Mormugao Harbour, Goa.
5. M/s Zenith Tin Works Pvt. Ltd., Clerk Road, Mahalaxmi, Bombay-34 WB.

SPEECH OF SHRI K. U. PATEL, PRESIDENT, ALL INDIA FOOD PRESERVERS' ASSOCIATION, DELIVERED AT THE 23RD ANNUAL CONFERENCE HELD ON 5TH MARCH, 1966, AT SHILLONG

Honourable Shri Chaliha, Ladies and Gentlemen,

It gives me great pleasure to welcome you all to the 23rd Annual Conference of the All India Food Preservers' Association. I particularly thank Shri Chaliha for finding time to inaugurate this Conference in spite of the fact that time is not his own. I specially wish to thank those guests and scientists and other friends who have travelled thousands of miles to be present on this occasion.



Shri K. U. Patel delivering the presidential address

You may remember that in my address at the last Conference, I had very specifically pointed out that the situation with regard to tinplate was going to be very difficult in 1965. In spite of this warning the authorities concerned did not take any action, with the result that the industry has suffered enormous losses last year and could produce canned goods to the extent of only 30 to 40 per cent of their capacity. Since March 1965 there is a very acute scarcity of tinplate for making open top cans for civilian pack as the whole quantity with the fabricators was diverted to the requirements of Army. The office of C.D.P. was fully aware of the situation, but did not wake up till the end of 1965. They were content to draw tinplate for their requirements from the tinplate stock usually utilised for civilian pack. The result of this was that the exports have gone down considerably, and the civilian pack has suffered to a very great extent. In absence of sufficient stocks of goods for civilian market, smugglers are busy selling their smuggled goods in the various cities.

Some time last year, certain amount of exchange was granted for the import of tinplate for goods for export, but since C.D.P. had no tinplate for packing his requirements, he collared this stock with the result that there was no tinplate for the last five months even for exports. I understand that very recently the Government has sanctioned an amount of Rs 17 lakhs in foreign exchange for import of tinplate for civilian pack and exports but I am now advised that the incoming tinplate under this licence has also been collared by C.D.P.

While the office of C.D.P. has collared our tinplate, they are not prepared to release any cans for packing by-products. They usually want mango slices or pineapple slices or orange segments and in all these cases the factories while producing the

main items find that they are left with a lot of pulp, juice and broken segments on their hands. These cannot be packed unless tins are released for packing these at the same time. The result will be that about 8000 tons of pulp and juice will have to be thrown away and the consequence is that the prices of the items required by C.D.P. will go up by at least 50 per cent, and not only this, these by-products valued at about Rs one crore and twenty lakhs, will have to be thrown away. This pulp and juices are usually made into nectars which are exported. Having thrown away these raw materials, there is no possibility of exporting any juices during the current year. What a waste in these times of acute food shortage.

As the local tinplate manufactured by Rourkela is not suitable for acid packs, the tinplate required for packing all varieties of acid packs has to be imported. For want of tinplate, guavas could not be packed this year. The season for pineapples is now on, and will last for a little over a month, but the factories cannot pack pineapple products for exports and civilian market because of want of tinplate of suitable quality. While we are talking of extending horticulture, it is a pity that those horticulturists in the South who, after taking immense pains, have developed pineapple cultivation over years, will have to sell their pineapples at a low price in the local market, with the result that they will lose considerable amount of money which they could have earned if the packers would have bought. In short, the pineapple crop of this year could not be made use of for want of tins. There is not even a remote chance of packing this item as the fruits are to be packed when fresh and cannot be kept for any length of time. The season for peas is nearly over and will be completely over by the time the Rourkela plate is received and cans manufactured from this plate are delivered to the packers. The sum and substance of this is that the packers could not pack guavas and will not be able to pack peas, tomato products, pineapples and orange products.

Since the plate intended for C.D.P. will now be coming in, he will have to return the stocks he has taken so far from the quota allocated for export packs and there will be some tinplate available, but the season is a snag. The exporters to be able to export mango products are, according to the present rules, to produce orders before cans are released to them. The foreign importer is not interested in our difficulties nor in our rules and regulations, nor does he want to place orders for his yearly requirements only during season time. The orders are received all the year round and once the mangoes are out of season, there is no way of packing these products. It is, therefore, necessary that the exporters whose performance is undoubted, should be given an advance quota of tins to be utilised for exports and asked to try their best to export as much as possible. Unless the cans are released when mangoes are in season, the exports will have to be lost. I know that the minds of the persons in authority are mostly closed to realities, but I only hope that they are not totally insulated against commonsense.

I have so far discussed the question of tinplate required by C.D.P. and for exports, and now I come to tinplate required for civilian pack. Out of a total production of this industry according to the information available to me, the requirement of C.D.P. were about 20 per cent and exports about 8 per cent last year. Even if cans are released in advance for packing export products when the fruits are in season, the total production covered comes to about 28 per cent. Since there will be tinplate only for 28 per cent production, the overhead costs will have to be met by a production of only 28 per cent, raising the prices

still further, at a time when the Government wants the prices stabilised. This will also result into the various factories discharging a substantial number of employees. Once they are discharged, it will be difficult to replace these trained employees. The conditions in this industry today have reached a stage where about 30 per cent of the factories are closed, 30 per cent on the verge of closing and about 40 per cent of the factories are working to a capacity of 30 to 40 per cent. Because of a cut in production due to want of tinplate and 28 per cent production having to meet total overheads, our present prices which are high enough, will be still higher in spite of the incentives given. This will mean that the products of this industry will be outpriced in the foreign markets and we will have to bid good bye to exports till conditions improve. These are branded goods and unless continuous supplies are maintained we will have a very difficult task in entering the export market again when conditions are normal.

Now I come to another difficulty faced by this industry. Tinplate and sugar are two main raw materials required by this industry. While I understand that there is a glut in sugar, the industry is crying hoarse for sugar to maintain its production of bottled goods. At the end of last year the industry was promised that since the production of sugar is satisfactory they will be allocated a special quota of 14000 tons for meeting their requirements, but now when the season for squashes has already started, are told that this is not possible. While we are exporting sugar at a price of approximately Rs 19 a maund, I wonder what special difficulty is there in supplying sugar to this industry at more than double the price. The factories which are running on a reduced rate of production are able to maintain this reduced rate by manufacturing bottled goods which require sugar but if this item is not available, the industry will have to reduce their production further as it cannot afford to buy sugar from the open market at a price, where it is available. Since sugar is controlled, I wonder why and how this is available in the open market. The Government is possibly aware of it, but it is a pity that no action is taken to stop this and to give sugar to this industry at reasonable prices. I can very well understand the reluctance of the Government to release sugar due to shortage, but I do not understand the logic behind the argument that they cannot release sugar at a time when there is a glut. It is possible that the office of Agricultural Marketing Adviser who exercise over-all control over this industry and the Fruit Products Control Order, are not able to fully convince the sugar authorities that sugar requested for is the minimum necessary for the very existence of this industry, or possibly they have not tried enough.

While no industry likes control, I would say that this was the only industry which invited control so that the quality of its products can be standardised and the development of this industry on right lines is expedited. The industry even agreed to pay a certain amount of licence fees for the administration for control and development measures. This Order came into force in 1946. The industry is now under control for over nineteen years. The Fruit Products Control Order lays down certain specifications for hygiene in factories and for maintaining quality control standards by various factories. There are about 899 factories and this control Order is administered by the office of the Agricultural Marketing Adviser to Government of India. I am very sorry to say that because of connivance and/or laziness or carelessness of the officials of this office, the Order is more observed in the breach than in observance of the conditions of the control in matters of hygiene. The Order lays down that factories having a certain amount of pro-

duction a year should employ qualified chemists. Even though the availability of such qualified personnel has increased recently, the office of Agricultural Marketing Adviser have not made any serious attempt to enforce these conditions in spite of the fact that this Association has pleaded day in and day out for stricter enforcement of this Order. This office was supposed to take energetic steps for development of this industry, but it is a pity that no steps are taken at all. While they take credit for the rapid development of this industry, I am sorry to say that this industry has developed to its present size in spite of the attitude of the officials of A.M.A.'s office. Not only this, the industry now feels frustrated and many of the major units are now inclined to sell their factories or to give up this line or rent out their premises at fair rent. These factories were constructed at a cost of several lakhs with high hopes but their hopes have not been realised because of an obstructive attitude of the staff of the office of A.M.A. The office instead of supporting progressive factories is positively retarding their progress. Things have reached such a pass that the industry which has been keeping quiet so far, now feels that the abolition of F.P.O. immediately is their only salvation. If Biscuits and Confectionery industry in the food group are not regulated under any control orders, under the present conditions, I do not see any necessity of continuing control over this industry alone and request the Government on behalf of this industry that this control be removed forthwith if they want the industry to expand.

I now come to the requirements of the products of this industry by C.D.P. While the C.D.P. is very keen and active in collaring all tinplate imported either for exports or for civilian pack in the name of Defence, I do not see that office equally active in making arrangements for import of tinplate for their own requirements. Since the industry does not get any cans for civilian pack and get only for packing C.D.P's requirements, they are obliged to accept orders under any conditions from C.D.P. to keep their factories going. The office of C.D.P. knowing this, is taking advantage of the situation in that they place orders with the factories and lay down the date by which delivery must be given, but do not care to release cans on time against orders placed, and in a number of cases, release cans against very large orders only a few days in advance of the date of delivery, and that too in driblets. The factories taking such orders during the last four months are very much disappointed and inconvenienced because of the annoyance created, as this office does not care to reply to any reminders or telegrams for cans. The industry feels that closing the factories and discharging labour after paying compensation will be a lesser evil than accepting orders under these conditions. They also now believe that it is only then that the eyes of the authorities concerned will open. I have written a number of letters to the office of C.D.P. pointing out that he should place orders only if he has cans so that the factories get cans at the right time, but he has not cared to hear the industry and insists on issuing orders without releasing cans. The industry quotes for various supplies on the basis of availability of particular items. Usually the season for a particular vegetable or fruit is one or two months and unless the factories get supplies during the peak season, they will not have the raw materials and naturally cannot fulfil the contracts. All the same, in conditions created by him, the C.D.P. reserves the right to levy penalties if the contracts are not fulfilled according to terms which hold good in normal conditions. This is not fair. I therefore appeal with all the earnestness at my command that the office of C.D.P. rectify these

matters forthwith, otherwise the industry will be obliged to stop quoting. In that case the C.D.P. will have to import his requirements at very high prices and spend foreign exchange. In the present set up, I know that the authorities do not usually take notice of these warnings, but only wake up when they find that drastic action is taken. I hope and trust that the industry will not be obliged to take any such action.

According to the recently published Rail budget, the freight rates for biscuit and confectionery have been reduced but this industry who has been clamouring for a reduction in freight rates for very obvious reasons, is given no relief. The industry has represented this matter to the Railway Ministry and I hope that the matter will be sympathetically considered.

Because of foreign exchange shortage, A.M.A. has recommended import of reduced quantities of chemicals and food colours for this industry, but I am sorry to say that even for these reduced quantities, no licences are so far issued with the result that the industry finds it very difficult to maintain the standards laid down. In absence of import licences, prices of certain chemicals and food colours have sky-rocketed. The industry is now asked to import from rupee payment countries as the Government has no free foreign currency exchange. While the F.P.O. and P.F.A. specify that colours and chemicals used by this industry must be of B.P. specifications, the chemicals available from East European countries are of different specifications and standard. Till this matter is sorted out, the industry will not be able to use the chemicals from East European countries and till such time as this is done, the industry feels that imports from free currency areas should be liberally allowed.

India has been exporting considerable quantities of Mango Pickle during the last fifty years and more to the various countries of the world wherever Indians have settled. India has also developed, during the last hundred years and over, the exports of Mango Chutney to the various countries of the world and this item is consumed by Indians as well as foreigners alike. From a very small beginning exports of these two items have reached a respectable total of Rs 50 lakhs per year.

Mango Slices in Brine which is a raw material for these items was partially allowed for exports uptill the end of 1964, but since then its exports are freely allowed with the result that the exports of Pickles and Chutneys have come down with a bang. This free export was allowed for an initial period of twelve months only. The twelve months have already passed and in spite of the representations of the various manufacturers and the industry as a whole, the Government has yet not thought fit to put a ban on the export of Mango Slices in Brine which they had promised when the ban on exports was lifted.

We are now told that the Government wants proofs and is trying to gather proofs to justify a complete ban on exports of Mango Slices in Brine. From April to September 1964, the value of exports of Pickles and Chutneys amounted to Rs 27 lakhs whereas after lifting the ban on the export of Mango Slices in Brine, the exports of Chutney and Pickles during April to September 1965 have come down to Rs 17 lakhs. The exports of Mango Slices in Brine have amounted to about Rs 4,05,000 for the same period. If the latest figures are available, I feel that the annual fall in the exports of Mango Chutney and Pickles amount to not less than Rs 25 lakhs. While the exports of Mango Slices in Brine are, for various reasons, higher in the early part of the year, exports of Mango Chutney and Pickles are in the later part of the year.

Besides, because of assistance and incentives, exports of Mango Slices in Brine to Britain are effected at prices less than the

prices obtaining locally. Due to free exports, the manufacturers now find that it is very difficult to obtain this raw material even at very much higher prices.

It has also to be remembered that Mango Chutney contains 52 per cent sugar. While sugar to foreign markets is exported at the rate of about Rs 19 per maund, it is sold in India for about Rs 42 per maund. This means that while exporting Mango Chutney we export half the quantity in sugar as an ingredient at the rate of Rs 42 against Rs 19 if only sugar is exported.

At this rate the Government is losing an amount of Rs 3,75,000 in foreign exchange on account of sugar content only as against their exports of Mango Slices in Brine amounting to Rs 4 lakhs.

There is, therefore, practically no gain in foreign exchange while a loss of Rs 25 lakhs annually in foreign exchange is a certainty if free exports of Mango Slices in Brine are continued. In view of these facts, I request that the authorities concerned look into this matter very carefully and take a decision at an early date, so that further damage to exports is averted.

The industry is feeling disturbed by the thought that the continuous misuse of the wide powers is likely to make the conscience of the authorities insensitive, if not quite blunt.

Platitudes and general expressions of concern, however, cannot achieve anything as the sands are beginning to run low in the hour glass of the existence of this industry.

Thank you.

PROCEEDINGS OF THE ADVISORY COMMITTEE MEETING OF THE ALL INDIA FOOD PRESERVERS' ASSOCIATION HELD ON SUNDAY THE 6TH MARCH 1966, AT THE CENTRAL STATE LIBRARY BUILDING, SHILLONG

DR G. S. SIDDAPPA

At the Technical Advisory Committee meeting of the Association on the 6th, I, as Convener, gave a brief account of work done during the year to solve some of the outstanding problems of the fruit and vegetable preservation industry in particular and food industry in general, based on the work conducted in the various Disciplines of the Central Food Technological Research Institute (CFTRI).

The series of critical investigations that had been conducted in connection with the comparative evaluation of four different types of tinplate for the fabrication of cans, including indigenous Rourkela plate and imported 1 lb. electrolytic plate, were highlighted. These results had indicated the possibility of developing indigenous tinplate of the right type for use in the food preservation industry in the country. Based on these, further action had already been initiated to improve the quality of the tinplate being manufactured at the Hindustan Steel Plant at Rourkela. There was a great deal of interest in these investigations, which had shown that with slight improvement in the quality of the base plate employed for the fabrication of tinplate, particularly with reference to the lowering of the phosphorus content, it could be possible to develop MR quality plate within the country itself. Further investigations for developing such a suitable type of base plate had already progressed at the Rourkela Steel Plant and there was every indication that it would be possible to meet the needs of the fruit preservation industry to some extent atleast, to start with, for base plate of practically MR quality, which is the plate universally employed for canning mildly acid as well as acidic products. Since fruits canned in India were practically of the acidic type, it was necessary to develop ultimately the MR quality plate for the purpose.

In continuation of the experiments already conducted on the evaluation of different types of tinplate to test their suitability for packing different types of products, a plan had been drawn up for a detailed and critical evaluation of the new type of tinplate to be produced by the Rourkela Steel Plant with base plate having definite phosphorus and silicon contents. This plan of experiments had been drawn up on the basis of discussions at an earlier meeting at Rourkela in this connection. The products included for test were quite exhaustive, but it might be possible to include a few more if the fruit preservation industry wanted to do so. With the existing list of products, as included in the proposed scheme of investigation, it would be possible to extrapolate the data to practically all types of products canned in the country.

As regards development of suitable blends of edible food colours for products such as canned green peas, tomato ketchup and sauces, etc., some additional work had

since been carried out to find substitutes for Acid Magenta II for tomato products and for Blue VRS for canned peas, since these two colours are to be deleted from the permitted list of food colours in this country. Some suitable blends had since been recommended. Further work was, however, necessary to evolve satisfactory blends. In the place of Blue VRS, Indigocarmine could be used with some advantage. Further, the situation regarding colour blends based on permitted colours required careful study in view of the recent recommendations regarding the use of colours in foodstuffs and the insistence of P.F.A. Rules on the declaration of the individual components in the colours employed.

As regards the training of personnel for the food processing industry in the country, steps had since been taken to upgrade the Associateship Course in Fruit Technology to one of Post-Graduate M.Sc. Degree Course in Food Technology of the Mysore University. In addition to this, short term courses of 7-8 weeks duration in different disciplines of food science and technology were to be conducted at specified intervals. It was hoped that these efforts of the CFTRI would meet the demand of the food processing industry for personnel of different levels of training.

Several other investigations at CFTRI to assist the food processing industry in the country, for example, studies on waxing the bananas with a view to export them to different countries, improvement of packages for fresh fruits and vegetables, suitability of tin and other containers for the packaging of pickles, analysis of different kinds of preserved fruits and vegetables under the FPO with a view to assist the industry with technical advice and guidance, extension and advisory work through various Experiment Stations situated in different parts of the country, designing and fabrication of some of the equipment required for the food processing industry, screening of different varieties of fruits and vegetables for their suitability for preservation, etc., were also referred to.

After this introduction, the members present at the meeting were requested to suggest additional problems which could be taken up at the CFTRI. They highly appreciated the work that we had been doing so far on various problems concerning the food processing industry in the country and also our attempts, based on actual experimental data, to assist in the development of suitable indigenous tinplate for the canning industry.

Dr D. S. Bhatia (Coca-Cola) stated that it would be desirable to include in the list of test materials, orange juice concentrate since it has high acidity. Shri V. B. Oberoi (Kissans) suggested that canned mango pulp which was used for making nectar and also fruit cocktail should also be included in the test materials. Since pectin at the moment was in short supply and had to be imported from other countries, the pilot plant for pectin, which was set up at the CFTRI recently, created a lively interest and led to some useful discussions. At this juncture, I pointed out that this pilot plant, designed, fabricated and installed at the CFTRI was utilizing dried unripe papaya fruit and also other waste materials such as orange peel and pomace, lime peel, etc. Preliminary experiments conducted with these different types of raw materials had shown that the plant could produce the right type of pectin. Nearly 100 kg. of pectin that had since been produced, and released to the fruit preservation industry, was found to be of excellent quality. There was thus scope for intensifying production of pectin in this plant. At this stage, Shri H. C. Bhatnagar (CFTRI) pointed out that in the case of citrus peel and pomace, there was likely to be much deterioration in the yield as well as jelly grade of the pectin since raw material had to be transported to the plant at Mysore from places

such as Bangalore and Nagpur, where large quantities of oranges are being processed. It would be necessary, therefore, to subject the material to some kind of preliminary treatment to destroy the enzymes, then dry the material and transport the dried material to the pectin plant at Mysore for further processing. At the NOGA plant at Nagpur, the peel has to be treated with calcium chloride solution to render it turgid for further extraction of orange oil on the Sfumatrice machine. After the extraction of the oil, the calcium chloride treated material was not quite suitable for the extraction of pectin. This was a serious draw-back in the utilisation of orange peel. Alternative treatment, perhaps with alum or with sodium chloride, has to be investigated to bypass the calcium chloride treatment of the peel. Although some work has already been done in this direction, it would take some time before the process could be standardised.

Shri Sardeshpande (Corn Products) suggested the possibility of getting orange oil as well as pectin by adopting a different procedure, namely, mincing and pressing the material for the extraction of oil, centrifuging the press liquid to separate the oil and then from the press cake getting the pectin in the usual way. Shri Bhatnagar (CFTRI) pointed out that this process would be investigated further. Dr B. L. Amla (CFTRI) stressed the necessity for further investigation with regard to the availability of sufficient quantity of raw material for the production of pectin and oil so that a suitable place could be selected for locating the pectin plant, depending upon the availability of raw material as well as other considerations. The Experiment Stations of the CFTRI could be of assistance in collecting the necessary data. Shri H. C. Bhatnagar (CFTRI) mentioned that Uttran, where lime oil is being produced, could be thought of as a Centre for pectin production also since lime peel yielded pectin of high jelly grade. Dr Bhatia (Coca-Cola) pointed out that extraction of oil from citrus peel was a more important consideration in view of the fact that orange oil, which fetches as much as Rs 66 per kg., was in great demand in this country for the beverage industry. The peel available in the country could not, there, be completely utilised for pectin production, without adopting the calcium chloride treatment, which is essential for the extraction of oil. I mentioned at this stage that the success of the pect n manufacturing industry in this country would depend upon the availability of raw material which could at present be considered as waste product only.

In connection with the colouring of canned peas, Dr H. C. Srivastava (Hindustan Levers) mentioned that addition of colour to canned peas could be avoided since systematic work carried by his organisation with regard to variety, cultural practices, etc., had indicated that peas of special quality suitable for canning without the addition of colour could be grown in the country. This, however, was a long range problem. Such systematic work should also be extended to various other fruits and vegetables that are processed, or likely to be processed in the country. These investigations should start right from the field. Shri H. C. Bhatnagar (CFTRI) mentioned that similar work was being done at the Experiment Stations. Work on peas and tomatoes had given very useful results. The members felt that work on varietal differences, etc., should be organised and conducted systematically so that the data could be readily made available to the industry. The progress of this work has to be watched to see that the data obtained resulted in the maximum benefit to the industry. Sporadic attempts in this direction were not likely to yield useful results. Dr Amla (CFTRI) stated that CFTRI has already made a beginning in this direction

and all the necessary data already available as a result of work done in various centres in the country would be compiled so that future work could be planned. Shri Stanley Nicholas Roy (United Fruit Co.) was emphatic that this type of work was absolutely necessary for the development of fruit and vegetable preservation industry in the country and that all available data should be made known to the industry so that it could form the basis for any future programme of work with regard to locality, variety, etc. The implementation of this would require the active assistance and co-operation of State horticulturists and others, since they would be the agencies that could take up developmental work, if necessary, with the active co-operation of the preservation industry.

Shri B. S. Bhatia (Defence Food Research Laboratory) informed the members of the various research activities in his organisation that would be of considerable interest and importance to the food preservation industry. The problem of the tin container for the processing industry was of great importance to them also. A number of other members such as M/s P. L. Roy, K. C. De, T. Rama Iyengar and G. S. Little John of Metal Box Co., M/s M. K. Pramanik and A. N. Sen of Hindustan Steel Ltd., Shri N. L. Jain of the Research and Development Organisation, M/s R. M. Kapadia and T. S. Bhat of Poysha Industries, Dr Naik Kurade of Allahabad Canning Co., and Shri M. I. David of Caico Industries, took part in the discussions regarding the investigations on the development of suitable tinplate in the country. They all expressed the hope that CFTRI, with its proposed investigations, would be of great help in solving the tin container problem of the industry. Shri S. C. Bhattacharjya of the Agricultural Marketing Directorate mentioned that special attempts were being made to meet the requirements of tinplate for defence, export and civil needs of canned foods.

Mango nectar was currently of great interest since there was considerable scope for its export to other countries. In this case, unfortunately, there was a tendency for the canned product to pick up tin rather quickly unlike other canned fruit juices. Experiments had been in progress in CFTRI to study the factor or factors responsible for this rapid pick-up of tin by this product. Based on some preliminary data, a more elaborate experiment has since been planned to find out a possible solution to this problem.

Practically every member present at the meeting, which was exceptionally largely attended, took part in the discussions on various points. The meeting was on the whole highly successful in that it indicated the present position regarding research and development and the role which research organisations like CFTRI could play in solving the problems of the food preservation industry. Our effort at CFTRI to be of active assistance to the industry was highly appreciated. The research workers at CFTRI would be very glad to do all that is possible, to be of assistance and service to the industry.

ALL INDIA FOOD PRESERVER'S ASSOCIATION

23rd Annual Meeting at Shillong, Technical Meeting—6-3-1966

	Name	*Address*
1.	Shri K. U. Patel	Tims Products Ltd., Calcutta; President, AIFPA.
2.	Dr G. S. Siddappa	CFTRI, Mysore; Convener, AIFPA.
3.	Shri S. H. Mehta	Farm & Fruit Products (P) Ltd., Calcutta.
4.	Dr B. L. Amla	CFTRI, Mysore.
5.	Shri Sardeshpande	Corn Products Co. (India) Pt. Ltd., Bombay.
6.	,, A. N. Sen	Hindustan Steel Ltd., Calcutta.
7.	,, S. C. Bhattacharjya	Directorate of Marketing and Inspection, Nagpur.
8.	,, R. N. Rustomji	James Smith (P) Ltd., Bombay.
9.	,, K. C. De	Metal Box Co., Calcutta.
10.	,, R. N. Goyle	Essex Farms.
11.	,, M. K. Pramanik	Rourkela Steel Plant Ltd., Rourkela.
12.	,, R. M. Kapadia	Poysha Industries Co. Ltd.
13.	,, T. S. Bhat	—do—
14.	Dr Anand C. Naik Kurade	Allahabad Canning Co.
15.	,, Dinesh Patel	Pure Products & Madhu Canning Ltd.
16.	Shri S. U. Mitra	Mida & Co. Pvt. Ltd.
17.	,, K. C. Maney	Kaycee Plantations & Cannings.
18.	,, D. P. Das	Fruit Technological Officer, Govt. of Assam, Gauhati.
19.	,, N. L. Jain	Officer-in-charge, A.F.D. Unit, R. & D. Organisation, Ministry of Defence, Najoj Gosh Road, Delhi Cantt-10.
20.	,, M. I. David	Canning Industries, Trichur.
21.	,, Enach I. Mehta	Dr Writer's Choc. & Canning Co.
22.	,, B. S. Bhatia	Defence Food Res. Lab., Mysore.
23.	,, J. Padmanabhan	A.P.V. Eng. Co. Ltd., Calcutta 29.
24.	,, R. K. Roy Talukdar	Fruto's & Co., Gauhati, Assam.
25.	Dr H. C. Srivastava	Hindustan Lever Ltd.
26.	Shri M. K. Tikkoo	G.G.F.P.Fy., Haldwani.
27.	,, R. Haque	Tulip Products Co., Calcutta.
28.	,, G. S. Little John	Metal Box Co., Calcutta.
29.	,, P. L. Roy	—do—
30.	,, R. S. Goenka	Fruto's & Co., Gaulip.
31.	,, S. Mordecai	Daw Sen & Co. (P) Ltd., Calcutta.
32.	,, H. C. Bhatnagar	CFTRI, Mysore.
33.	,, V. B. Oberoi	Kissan Products Ltd., Bangalore.
34.	,, J. K. Jagtiani	Ministry of Food, GOI, Calcutta.
35.	,, H. N. Kadbet	Poysha Industries Co. Ltd., Bombay.
36.	Dr D. S. Bhatia	Coca-Cola, New Delhi.
37.	Shri Stanley Nicholas Roy	United Fruit Co. Ltd., Shillong.
38.	,, T. M. Rama Iyengar	Metal Box Co., Calcutta.

PRELIMINARY STUDY OF BLANCHING CONDITIONS ON COLOUR, FIRMNESS AND MUCILAGE OF CANNED BHINDI-OKRA (*HIBISCUS ESCULENTUM*)

S. M. JAFAR, B. REVIS AND W. B. DATÉ

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BHINDI-OKRA (*Hibiscus Esculentum*) is being canned, to some extent, for supply to Army as well as civilian market. This vegetable unlike others produces a slimy condition in the covering liquid. The green colour also degrades during canning and storage. These two major problems in the commercial canning of Bhindi have so far not found a satisfactory solution.

The conventional method of blanching vegetables in steam or boiling water is receiving attention of research workers with a view to study the temperature and the holding time during blanching on the characteristics of blanched material. The results reported in this connection by Kaczmarzyk *et al*[1] and Dietrich *et al*[2] show that low temperature and long time (LT LT) blanching improves the texture of green beans. For LTLT blanching a temperature of 190°F to 195°F and a holding time of 3 to 5 minutes were employed as against the conventional 200°F to 212°F for 1 to 2 minutes. Hoogzand and Doesburg[3] showed that cauliflower retains a better texture when blanched at 158°F for 15 minutes as against blanching at 212°F for 4 minutes.

In order to explore the effect of LTLT method of blanching compared with the conventional method[4,5] on the characteristics of Bhindi, trials were done using a few selections of this vegetable. The effect of sodium chloride concentration in covering liquid was also studied in relation to the release of mucilage by Bhindi during storage.

Experimental

1. *Varieties of Bhindi:* Three different varieties of Bhindi viz. Kalianpur Type 1, Kalianpur-Bonia (Mosaic affected) and Kalianpur-Bonia (Mosaic free), were obtained from the Govt. Vegetable Research Station, Kalianpur, Kanpur. A fourth mixed variety was obtained from Lucknow vegetable markets. This sample appeared quite obviously as a mixture of some two or three varieties. It was not possible to adopt size grading of the material specially in respect of the varieties obtained from Kalianpur as the quantities made available were not sufficient for this purpose. However, the material used for trials was fairly uniform in maturity and colour.

2. *Canning Procedure:* Bhindi was sorted for as much even green colour as could be done visually. The stalk ends were cut close to the carpellary cavities while the tapering ends were trimmed slightly. Known weights of Bhindi in different lots were blanched by putting the material in a wire cage and dipping in a water bath for stipulated temperature and time. After blanching the vegetable was cooled by placing the cage under running tap water. Each lot was then filled into A 2½ size plain cans. Brine (3 per cent NaCl) at boiling temperature was used as a covering liquid. The cans were immed-

iately sealed, processed at 240°F (10 lbs. steam pressure) for 35 minutes and were subsequently cooled in water to approximately 100°F. The cans were then wiped dry and stored at room temperature.

For blanching, two different temperatures and time intervals were employed, viz. 200°F for 3 minutes; 135°F for 15 minutes. To study the effect of sodium chloride concentration on the physical properties of canned Bhindi, sodium chloride solution at 1 per cent, 2 per cent and 3 per cent levels was used as a covering liquid. Blanching conditions were, however, the same as mentioned above.

3. *Methods of Evaluation:* The different lots of canned Bhindi were examined for viscosity of the covering liquid, green colour, and firmness of the vegetable after a storage period of four weeks.

(*a*) The viscosity of the covering liquid was taken as an indirect measure of the release of mucilage in covering liquid during processing and storage. To measure viscosity a 1:1 (W/W) dilution of the covering liquid with distilled water was used. These determinations were done at 20°C using No. 3 Oswald Viscometer.

(*b*) Green colour, mainly chlorophyll pigment, was extracted for colorimetric estimation and the procedure recommended by A.O.A.C.[6] was used for this purpose. Material taken for chlorophyll estimation was free from seeds and seed bearing stalks. The results presented in Table I for colour are not intrinsic values but represent per cent retention of green colour when compared with the colour of the same lot blanched at 200°F.

(*c*) The firmness of the vegetable was judged empirically noting the toughness or softness of the material as well as splitting along the ribs. The results in this respect are, therefore, approximately relative.

Discussion

As will be seen from the figures given in the Table I, low temperature and long time blanching (LTLT) method has shown better retention of green colour, firmness of the vegetable and less liberation of mucilage in the covering liquid. In case of samples blanched at high temperature and short time (HTST) there is not only a greater loss of colour, but the material invariably showed breakage along the ribs and the covering liquid had increased in viscosity and quite often had become semi-solid. The difference in viscosity of the covering liquid in samples 3 (*a*) and 3 (*b*) (market samples) is probably due to the difference in the proportions in which different varieties of Bhindi were mixed in these samples. The results for texture agree well with those of Kaczmarzyk *et al*[1] and Hoogzand *et al*[3] who observed similar effects in case of green beans and cauliflower respectively. The retention of green colour as a result of LTLT blanching is, however, not similar to the one obtained by Dietrich *et al*[2] who reported poor retention of green colour when green beans were blanched in water at 190°F to 195°F. The dissimilarity in the results could probably be due to a lower blanching temperature (135°F) used in the present trials.

The data on the relative viscosity of the covering liquid points out that LTLT method of blanching in some way blocks

TABLE I. *Effect of blanching conditions on mucilage, colour and texture of canned bhindi*

Sl. No.		Varieties of the vegetable	Locality from where collected	Blanching temperature (°F)	Blanching time (minutes)	Viscosity of covering liquid as compared to water	Percentage increase at LTLT blanching	Texture of the vegetable: (Organoleptic evaluation)	Remarks
1	(a)	Heterogeneous vegetable ...	Chauk-Mandi, Lucknow	200	3	5.8	...	Soft	
	(b)	,,	,,	135	15	5.6	18.36	Firm	
2	(a)	,,	,,	200	3	6.0	...	Soft	
	(b)	,,	,,	135	15	4.92	0.75	Firm	
3	(a)	,,	Narhi-Mandi, Lucknow	200	3	8.0	...	Soft	
	(b)	,,	,,	135	15	10.6	32.18	Firm	
4	(a)	,,	,,	200	3	7.4	...	Soft	
	(b)	,,	,,	135	15	7.07	7.84	Firm	
5	(a)	Kalianpur-Type 1 ...	Kalianpur, Kanpur	200	3	6.9	...	Soft	
	(b)	,,	,,	135	15	4.1	5.81	Firm	
6	(a)	Kalianpur-Bonia, (Mosaic affected)	,,	200	3	9.1	...	Soft	
	(b)	,,	,,	135	15	5.7	27.45	Firm	
7	(a)	Kalianpur-Bonia, (Mosaic free) ...	,,	200	3	7.07	...	Soft	
	(b)	,,	,,	135	15	5.4	8.47	Firm	

TABLE II. *Effect of blanching conditions and concentrations of NaCl in covering liquid on the viscosity and colour of canned bhindi*

	LTLT			HTST		
1 Blanching conditions	LTLT			HTST		
2 Per cent NaCl in brine	1	2	3	1	2	3
3 Viscosity of brine as compared to water	62.3	53.0	33.0	103.7	250.4	136.0
4 Per cent increase in colour at LTLT as compared to same levels of salt at HTST	4.8	37.8	42.8			

the liberation of mucilage into the covering liquid. It is generally believed that Bhindi liberates more mucilage if the carpellary cavities are exposed to the surrounding liquid. The advantage gained particularly in respect of reduced breakage along the ribs is very interesting and warrants further study to understand and confirm this phenomenon.

The data in Table II show that sodium chloride solution as a covering liquid bears a relation to the viscosity of the brine as well as retention of green colour of the product. It could be pointed out that of the three levels of salt solution studied 3 per cent level appears to be most effective for both (*i*) keeping the viscosity of the brine low and (*ii*) retention of green colour.

Conclusion

The data presented here show that LTLT method (135°F, 15 minutes) combined with

the use of 3 per cent salt solution for covering liquid, helps in (*i*) better retention of green colour, (*ii*) texture and (*iii*) reduced liberation of mucilage in the covering liquid during canning and storage. Further extensive trials have been planned during the Okra season.

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FURTHER STUDIES ON CANNING OF DRIED PEAS

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Canned or dehydrated peas is a very popular item in demand by civilians and defence organizations. To bridge the gap between demand and supply of preserved peas, dried peas, otherwise called processed peas, are canned in substantial quantity in some of the countries in the West and to some extent in India also. Das, Siddappa and Lal[2] showed that all varieties of peas grown in the country are not suitable for canning as processed peas and concluded that it was possible to develop this type of preservation of peas on the basis of some selected varieties.

Peas are grown very extensively in Northern India and a good number of varieties both old and newly introduced are being cultivated. Canning trials of four popular varieties, reported in this paper, are primarily intended to supplement the recommendations of Das *et al.*[2] An attempt has also been made to study some additional factors to improve the quality of the product.

Experimental Material and Methods

Three varieties of dried peas, namely *Canners' Perfection*, *Perfection No. 326* and *Marrow-fat* were supplied by Govt. Garden, Chaubattia (Dist. Almora) and a fourth variety *Bonville* was obtained from Vijaya Nurseries, Kukra (Dist. Lakhimpur). The physical characteristics, specific gravity and moisture content of each variety were noted. For studying rehydration property, known weights of pea grains were soaked in excess of boiling hot water for variable periods. Dried peas even after prolonged pre-soaking in water do not become sufficiently soft. To study the effect of different methods of soaking and blanching, following procedures were adopted using only *Bonville* variety: (1) Peas soaked in boiling hot water for different durations. (2) Peas blanched in boiling plain water or alkaline water for different durations. (3) Blanched peas were filled in A2½ size cans and covered with brine solution containing 2 per cent salt, 4 per cent sugar and apple green colour (4 gm./100 lbs. of brine). The cans were exhausted till the centre of the cans showed temperature of 180°F. (4) The cans were immediately sealed and sterilized at different temperatures and for different time intervals. The above details of soaking, blanching and sterilization intervals are presented in Table I. Peas of other three varieties were canned by using only those steps which were found to be satisfactory excepting sterilization time and temperature. This procedure was as follows: The peas were placed in boiling hot water and allowed to soak for 16 hours. The first lot of soaking water was replaced by fresh boiled water after 8-10 hours. The rehydrated peas were blanched in boiling 0.2 per cent sodium bi-carbonate solution for 60 minutes.

TABLE I. *Soaking, blanching and sterilization treatments followed in the trials*

Soaking time in hours	Blanching in minutes	Sterilization Temp.	Sterilization Time in minutes
(In cold water) 6	(In water) 6	240°F	40
" 16	" 20	"	"
" 16	" 20	245°F	"
" 16	" 20	"	"
(In hot water) 16	" 20	"	50
" 16	" 30	"	"
" 16	" 30	250°F	"
" 16	" 30	"	60
" 16	(In 0.1% $NaHCO_3$) 30	"	50
" 16	" 30	"	60
" 16	" 60	"	"
" 16	(In 0.2% $NaHCO_3$) 60	"	"

These were given a quick wash in warm water and filled in cans. Brine solution containing 2 per cent salt, 4 per cent sugar and green colour was used as a covering liquid. After exhausting and sealing, the cans were sterilized at 15 lbs. steam pressure for 40 as well as 60 minutes, and at 10 lbs. steam pressure for 60 minutes.

The cans were examined by cut-out tests a week after packing and particulars such as appearance, flavour, texture, increase in drained weight and splitting of grains were recorded.

Results and Discussion

Observations on the physical characteristics, specific gravity and moisture content of the dry pea grains are recorded in Table II.

All the four varieties taken for study are wrinkled varieties. *Marrow-fat* is large and some what kidney-shaped. Grains of other varieties are obtuse in shape and of medium to large size.

Data regarding the rate of increase in weight and volume are given in Table III. It was observed that the rate of absorption of water by the grains became constant after 8 to 12 hours. The maximum absorption occurred in the case of *Canners' Perfection* and was the least in the case of *Bonville*.

Cut-out observations of the samples of all the four varieties packed as above are given in Table IV. *Canners' Perfection* and *Marrow-fat* varieties gave a satisfactory product having good organoleptic quality. The grains showed good swelling. *Bonville* variety stood next in order. The grains of *Bonville* variety were light in colour, but

TABLE II. *Physical characteristics of pea varieties employed for canning*

	Marrow-fat	*Bonville*	*Canners' Perfection*	*Perfection 326*
Physical characteristics	Large, kidney shape, highly wrinkled. Yellowish green in colour	Medium, obtuse, wrinkled. Light yellowish, green	Large, obtuse, wrinkled. Pea green in colour	Small, obtuse, wrinkled. Yellowish light pea green
Specific gravity ...	1.021	1.023	1.023	1.023
Moisture % ...	14.526	14.041	15.992	14.486

TABLE III. *Per cent rate of increase in weight and volume of pea grains on water soaking*

Period in hrs.	*Marrow-fat*		*Bonville*		*Canners' Perfection*		*Perfection 326*	
	Weight	Vol.	Weight	Vol.	Weight	Vol.	Weight	Vol.
2	100.4	106	90.6	93.9	93	96.9	95.4	110.2
4	125.4	140	112.4	114.5	120.0	144.0	118.6	133.3
8	129.0	145	126.4	140.9	141.0	160.4	130.4	147.7
12	143.2	155	126.8	145.0	155.2	173.9	145.0	153.3
16	143.2	180	136.2	150.0	155.3	179.3	145.0	161.3
20	144.0	180.9	143.0	164.2	156.0	181.3	146.0	162.2

TABLE IV. *Cut-out report on canned peas*

	Marrow-fat	*Bonville*	*Canners' Perfection*	*Perfection 326*
1. Drained weight in gms.	470	470	470	470
2. Vacuum in inches ...	15	15	15	15
3. Condition of grains ...				
(*a*) Organoleptic ...	Normal pea green colour, soft not fully swollen, less starchy, sweet, slightly slimy to touch.	Light yellowish greeny, relatively firm, taste and flavour good.	Attractive pea green, good soft texture, taste —normal.	Pea green slightly greyish, slightly firm, slimy to touch.
(*b*) Physical ...	...	...	...	...
(i) Cracking Bursting per cent ...	15	5	20	5
(ii) Swelling Ratio	2.48	2.42	2.50	2.48
4. Condition of the brine				
(i) T.S.S. % ...	6°	5°	6°	5°
(ii) pH ...	6.7	6 7	6.7	6.7
(iii) Colour/clarity...		Clear, light greenish yellow and slimy in all cases		

N.B.—All above samples were sterilized at 10 lbs. steam pressure for 60 minutes.

were tough in texture as compared to *Canners' Perfection* and *Marrow-fat*. In the case of *Perfection No. 326*, the grains were very tough, and the taste and flavour of peas were not perceptible. They also showed slight darkening on canning.

As regards processing temperature and time, it was found that 10 lb. steam pressure (240°F) for 60 minutes or 15 lb. steam pressure (250°F) for 40 minutes was found to be satisfactory in respect of all the varieties and especially for *Bonville* and *Perfection No. 326*.

Microbiological check of soaking water was also carried out. Longer soaking periods are conducive to multiplication of micro-organisms mostly of the flat sour type. When pea grains after rehydration were washed repeatedly to reduce the number of micro-organisms, incubation tests of the cans at 37°C did not reveal development of flat sour or bulging of the cans. It was found in these trials that soaked grains, when washed three times, were free from any organism.

Summary

Out of the four wrinkled varieties of peas used in these trials, *Canners' Perfection* and *Marrow-fat*, when soaked for 20 hours, blanched in 0.2 per cent $NaHCO_3$ solution for 30 minutes and sterilized at 10 lbs. (240°F) for 60 minutes gave product with relatively satisfactory organoleptic qualities. *Bonville* and *Perfection No. 326*, though not so satisfactory, can be packed using higher processing temperature for longer time.

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CONTAINERS FOR TRANSPORT OF FISH

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Introduction

The *per capita* catch of fish in India is very low—2.25 kg./annum. Only 47.9 per cent of the total fish landings enter the market as fresh fish and the bulk of the catch is consumed in coastal regions. On account of inadequate facilities for storage, transport and distribution, the pattern of utilisation of fish has remained more or less unchanged over a period of years. In spite of low *per capita* catch, there is an excess supply of fish in the coastal regions during fishing season whereas inland areas go hungry for fish. This brings about a few evil consequences—(*a*) fishermen do not get proper price for their catch; (*b*) no incentive to increase the catch of fish; and (*c*) wastage of fish when there is demand elsewhere.

Proper utilisation of the present fish catch is as important as catching more. In under-developed countries, increased utilisation of fresh fish should be considered of greater importance than costlier and capital intensive methods of preservation like canning and freezing.

In U.K., 60-70 per cent of fish reaches the consumer packed in ice. This has been made possible through use of improved containers and refrigeration facilities. The trend in utilisation of fish in some leading countries is given in Table I.

Improvement in the utilisation of fish in fresh form will involve development of better techniques of handling and preservation which will increase the supply of fish to the consumer significantly. The practical way to preserve the fish in prime condition for a limited period is to store in ice. The lower the temperature the longer the storage life, but with ice a temperature below 32°F is not attainable.

Time-temperature Relationship: It has long been realised that freshness of fish depends primarily on its temperature and the time that has lapsed since its catch.

TABLE I. *Utilization of fish catch in selected countries (1960)*

Countries	Total catch in '000 metric tons	Fish catch *per capita* kg. per year	Per cent Utilization					
			Fresh	Freezing	Curing	Canning	Reduction	Miscellaneous
Japan ...	6192.5	66.2	22.6	12.8	43.6	6.7	13.9	0.4
Peru ...	3501.4	325.3	2.3	0.5	0.6	1.9	97 7	...
U.S.S.R. ...	3500	14.2	15.5	30.5	30.2	11.8	10.8	0.1
U.S.A. ...	2796.9	*15.6	30.0	11.2	1.3	28.8	34.4	0.2
Norway ...	1598.9	445.7	10.8	9.7	26.8	3.0	48.8	0.1
India ...	1159.9	2.5	47.9	...	43.7	...	8.4	...
U.K. ...	1076.6	17.5	79.8	11.2	2.6	0.9	3.0	2.4
Canada ...	915.2	51.3	20.6	29.9	30.8	7.2	9.3	2.4
S. Africa ...	465.8	36.6	19.8	6.1	15.5	11.6	46.8	0.2
Spain ...	836.7	31.0	65.9	...	18.9	12.4	2.8	...
World ...	37,700	12.6	40.0	9.0	19.0	9.0	20.0	3.0

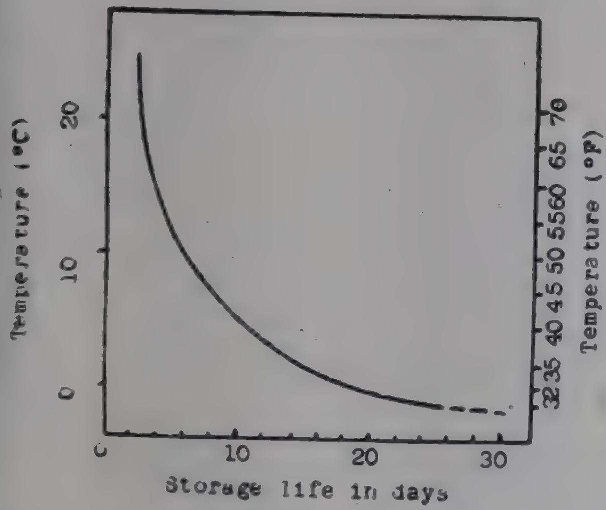
Data collected from *Fish as Food*, Vol. II, Ed. G. Borgstrom (1962) - * Calculated

Higher the temperature, faster the bacterial growth in the fish thereby producing unpleasant by-products. The initial bacterial load and the nature of contamination play a vital role in the deterioration of fish. Investigations carried out at Torry Research Station, U.K., with the fishes of British Isles, indicate that the spoilage rate measured organoleptically, chemically and bacteriologically, increases at constant rate with temperature between—1°C and 25°C. For example fish which may remain in an edible condition for 16 days at 0°C would remain good for 21½ days at—1°C but only for 10½ days at+1°C. The storage life of cod with change in temperature is given in Fig. 1 & 2. The effect of temperature on bacterial growth is given in Fig. 3. Though the data as such may not be wholly applicable for fish caught in other regions, they indicate a trend which is likely to occur with other fish.

Preservation of Fish with Ice: The problems associated with the ice preserva-

FIG. 1

Change in storage life of cod with change in temperature (a)

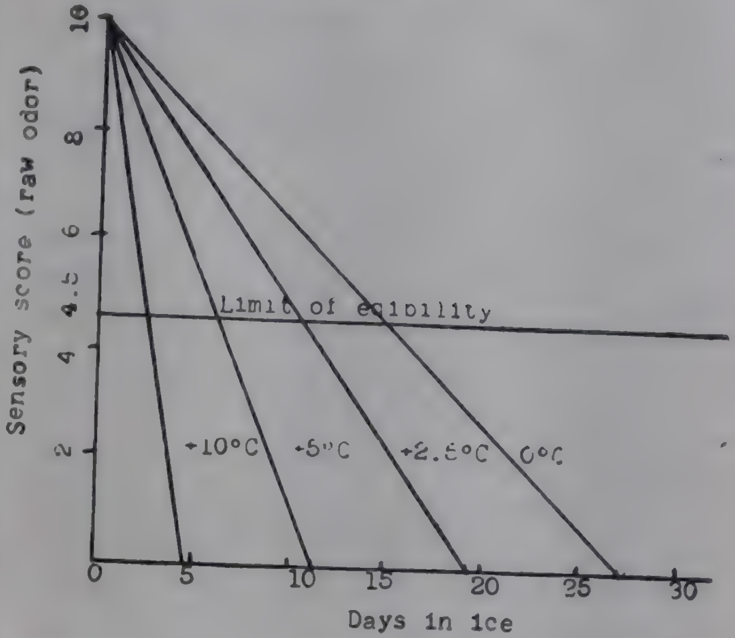


Note that slight lowering of temperature below 0°C (32°F) greatly increases storage life as judged by chemical and teste-panel methods of assessment.

Ref: "Developments in handling and processing fish" by G.H.O. Burgess, p. 28 published by Fishing News (Books) Ltd. London.

FIG. 2

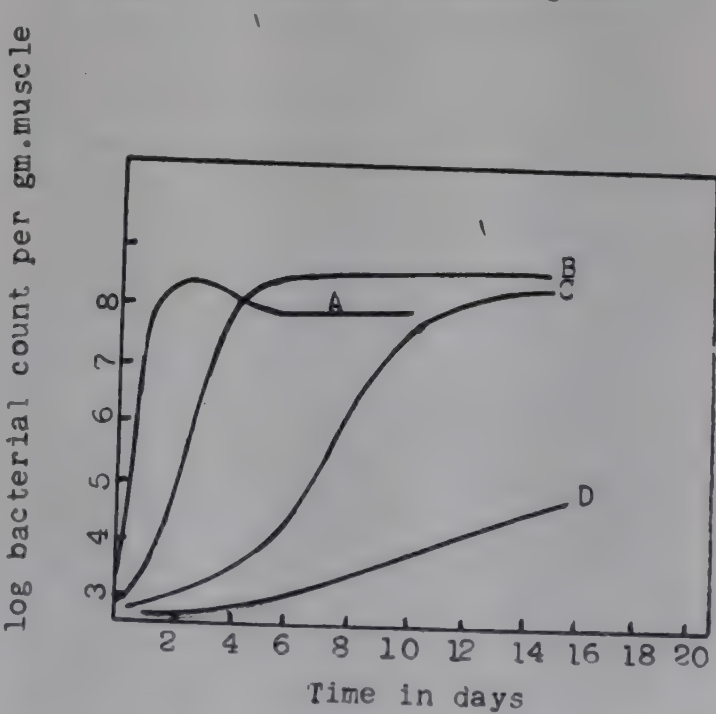
Change in storage life of cod with change in temperature (b)



Ref: Lectures given to students of "Fish Handling and Processing Course" in the year 1962 organised by Torry Research Station, United Kingdom.

FIG. 3

The effect of temperature on bacterial growth



Ref: "The microbiology of sea-water fish" by J. M. Shewan published in the book "Fish as food", Vol. I by G. Borgstrom, Academic Press, New York, 1961, page 503.

tion of fish are (*a*) non-availability of ice at reasonable price, (*b*) lack of adequate refrigerated storage facilities at important landing places, (*c*) inefficiently developed transport net work between landing centres and the markets, and (*d*) lack of suitably insulated containers for transport and distribution.

The first three problems are being gradually looked into all over the country. However, on account of high initial capital investment and shortage of foreign exchange, the measures have not been very effective.

In this paper, efforts are made to analyse problems associated with the development of suitable containers for transport and distribution of fish. A right type of container will go long way to make best use of ice used for holding fish. In India, with its hot and humid tropical climate, suitably insulated containers are needed to keep fish at a low temperature with ice.

The Requirements of Fish Containers: The most important requirements are (1) size of container suitable for the type of fish to be packed, (2) easy handling under operating conditions of transport, (3) durability, (4) the resistance to stress and strain in transport, (5) insulation to prevent excessive melting of ice, and (6) prevention of leakage of drip water. In designing and fabricating a durable container cleanability, sanitariness and wear and tear are the chief considerations; for disposable containers, price will be the determining factor.

Containers in use in India: The types of containers used in different parts of the country vary. However, they consist mainly of two types: (*i*) bamboo baskets, and (*ii*) wooden boxes. Metallic containers made of aluminium and galvanised iron are used for special purposes only. There is no standard size for bamboo baskets. Their capacity ranges from 4.5 to 45 kg. of fish and they can be re-used 2-3 times. The wooden boxes also do not conform to any standard size. They are made from locally available wood and being sturdier than bamboo baskets are re-usable for longer time. Empty tea-chests made of plywood are used in certain parts of the country. They seem to have better insulation than ordinary wooden boxes. However, they are not specially designed and manufactured for fish transport. The bamboo baskets and wooden boxes have number of disadvantages like poor insulation, less durability, unsanitariness and pilferage during transport.

No systematic attempt has been made to collect data on the estimated loss of fish on account of defective packaging under various conditions of handling and transport. Some useful idea can be obtained from the available information in the literature dealing with the storage of fish in ice under different conditions. However, it should be noted that the data from one set of experiments carried out with one or two species of fish and under certain specific conditions may not be generally applicable to another set of conditions.

In the experiment carried out at Central Institute of Fisheries Technology, the sardines and few fish packed in bamboo baskets (un-insulated) with ice in the ratio 1:1 by weight were found unacceptable after 18 hours. Work carried out in C.F.T.R.I. Station at Mangalore has shown that even precooled fish (sardines, carps) when packed in ice (1:1 ratio) in un-insulated bamboo basket could not be maintained in edible condition beyond 14 hours while in insulated baskets the fish was found edible at the end of 16 hours. It is also observed by workers at C.I.F.T. at Veravel Station that when pomfrets were packed in ice in plywood box (un-insulated), ice melted within 20-24 hours.

Development of new Containers: In recent years in Western countries besides wooden and aluminium containers plastic fish boxes have also been designed. They

are used most extensively in U.S.A. and in several European countries like U.K., France, Germany, Norway, Denmark, Italy and Portugal for handling and shipment of fresh and frozen fish. These new plastic fish boxes are made of high density polyethylene, polysterene and P.V.C. and have several advantages over traditional wooden boxes, or metallic containers. They are light-weight, non-absorbant, sanitary, corrosion-resistant, stackable and easy to maintain.

High density polyethylene fish boxes are manufactured by injection moulding process and have already become popular in U.S.A. Its low thermal conductivity delays the melting of ice and maintains fish at low temperature during transport. Special drain holes at the bottom ensure drainage of drip water. The use of wooden and aluminium containers are also being discarded in East Germany and polysterene material is being introduced for fabricating containers for transport of meat and fish. In France, high density polyethylene containers have substituted returnable wooden cases at important fishing ports. The design allows for stacking during loading and for nesting when empty. This feature is very convenient for fish trade as it offers space economy and easy handling.

The disposable corrugated fibreboard containers are being designed by various firms for carrying seafood. They are either wax impregnated or poly-lined or P.V.C. coated to make them water-proof. Poly-lined or resin impregnated kraft paper is recently used as liner for fibreboard fish boxes. The polyethylene lined cartons do not crack when the board is creased on forming. They also possess superior grease resistance and are unaffected by freezing temperatures. These developments in the container manufacturing have a definite place in advanced countries, but in countries like India, these new containers have to be produced at a price that will compete with the low cost of the containers currently in use.

Scope of Improvements in the Traditional Containers: Under the circumstances it appears advisable to direct more efforts to bring about improvements in the traditional containers.

1. *Insulation:* Attempts have been made to insulate the traditional containers by using (1) thermocole, (2) polyethylene lined gunny cloth and (3) bitumen lined kraft paper. The plywood boxes (18″ × 18″ × 28″) were insulated with polyethylene wrapped ⅜″ thermocole board. The trial conducted with these improved containers showed a three-fold increase in the storage period. The insulation boards can be re-used 4-8 times. Central Institute of Fisheries Technology has developed thermal insulating boards from coconut pith for fishing trade. In view of low cost and comparable physical characteristics with other insulating materials, its use has been claimed to be promising.

Rate of melting of ice can be considerably reduced by introducing suitable insulation liners in the baskets used extensively for transport of fish in the country. This does not introduce change in size, shape or the carrying capacity of the containers. The relative time taken for fish packed in ice (1:1 ratio) to raise the temperature to 41°C is indicated in Table II.

TABLE II. *Relative efficiency of liners for bamboo baskets*

Type of insulation	Period in which the content rise to 41°C temperature
1. Without any lining	9 hours
2. With 300 gauge polythene lining	11 hours
3. With Bitumen coated Kraft-paper	15 hours
4. With gunny lined with polythene (300 gauge)	17-18 hours

From the Table II, it is clear that the polyethylene laminated gunny cloth has decided advantages but it also suffers from certain draw-backs, such as getting wet easily and losing insulation characteristics. A new bamboo container with poly-lined gunny as insulator devised at CFTRI has proved more efficient in this respect. The container consists of an outer bamboo basket separated from an inner basket by polyfilm lined gunny. Polyfilm inside the inner basket would prevent the wetting of the liner. All these insulating materials have limited use in the transportation of fish. They cannot be used successfully for hauling the fish over long distances.

2. *Reusability:* In India the fishing season lasts for 100-120 days in a year. Any container meant for re-use should last for the entire season which may mean 10-12 trips. The bamboo and wooden container presently in use do not last for more than two or three trips. Increasing the reusability of wooden container to 6 trips or above would bring down the cost of transportation considerably. The savings thus effected can pay for better insulation and making the container more durable. Metallic containers made of aluminium or corrosion-resistant aluminium alloy have the advantages of being light-weight, more durable, sanitary and easy to handle. They are used exclusively in freezing plants, cold storages and refrigerated transport. Their extensive use in India is not likely at present as the initial cost is several times that of cheapest containers available.

3. *Cleanability:* When bamboo or wooden containers are re-used, they get heavily contaminated with bacteria. The disadvantage of wooden box is that being porous, it harbours dirt, and bacteria which cannot be removed by washing or scrubbing and act as a source of further contamination of fish. The bacterial contents of new and used fish boxes were determined and the results indicated that the bacterial content of a box increased by over million times when used once. The investigations showed that practice of cleaning the boxes with cold water without sanitizers and drying in the sun was not very effective. Even hosing with water and subsequent steaming does not appreciably reduce the bacterial load on the surface of the container. The older wooden boxes are difficult to clean even with prolonged steaming. When initial bacterial load is very high, even 99 per cent reduction by the use of disinfectant still leaves considerable bacterial load. In U.K., D.S.I.R. has recommended use of a non-returnable (38. 1 kg. capacity) wooden box which is not only sanitary but also the cheapest container available. Frequent causes of damage have been minimised by strapping the boxes with steel and using suitable fasteners in the construction of the box.

The problems of keeping fish containers hygienically clean under commercial conditions is complicated by repeated heavy contamination and continual use. It is impossible to effect complete elimination of bacterial organisms under operating conditions. In many areas, wooden fish boxes have been improved by spraying the inside with plastic coating. The plastic coated wooden boxes could be cleaned as they are less liable to spoilage and the bacterial contamination could be reduced to one-tenth. Use of disinfectant and scrubbing the surfaces reduce the bacterial load. Hypochlorite solution containing 1000 p.p.m. free chlorine and quarternary ammonium compound, 0.1 to 1 per cent strength—are most effective sanitizers available. Hypochlorite is cheapest and best for application in food industries. In U.K. and Germany, fully automatic washing machines are installed at important fishing ports. Such plants handle from 4000 boxes per 8 hours (U.K.) to 8000 boxes per 8 hours (Germany).

4. *Quantity of Ice:* For packing fish in containers sufficient quantity of ice should

be used to bring down the temperature to 0°C. The accumulated blood and slime should be allowed to drip. One kg. of ice absorbs 80 Kcal heat to melt to water at 0°C. Assuming specific heat of fish at 0.9 and that no external heat is absorbed, approximately 2 kg. of ice is required to bring down the temperature of 8 kg. of fish from 22°C to 0°C. Thus the ratio between weight of ice to fish is 1:4. Keeping in view heat absorption due to improper insulation and high ambient temperatures, the ratio of ice to fish has to be increased to 1:1. Under tropical conditions the ratio of 1½ parts of ice to 1 of fish is suggested for long distance transport. The quantity is reduced when fish is transported in refrigerated vans. The ice should not be spread uniformly throughout the pack. It is recommended to place 1/3 of the total quantity of ice at the bottom, 1/3 in between layers and remaining 1/3 on top.

5. *Pilferage:* In long distance transport through railways, the containers are used without lids. Sometimes, they are covered with gunny cloth and tied with coir. The possibilities of pilferage in such type of containers and with present mode of packing are generally high. No data is available on containers lost or damaged during journey and containers becoming unserviceable on return.

Conclusion: It is unlikely that there will ever be a single best design of container, as the conditions under which containers are used vary considerably. Any programme for the popularisation of improved containers will not only take into account the need for a new container design but also its economic feasibility. However sound the technical reasons may be for a change, the commercial feasibility would be the deciding factor.

Before undertaking a programme for container design and manufacture it is necessary to have data on the estimated loss to the trade on account of (*i*) temperatures maintained during different stages of assembling and transport of fish, (*ii*) containers lost or damaged during journey and (*iii*) container becoming unserviceable on return. The high price of containers made out of metal, plastic or paperboard limits their immediate introduction into the fish trade, therefore it would be necessary to improve the bamboo basket and wooden boxes for an immediate relief to the industry.

In order to bring in improvement in these containers it is necessary to look for (1) an inexpensive disposable insulation liner for bamboo baskets and (2) to make the wooden containers better insulated, durable and sanitary.

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CHEMICAL ADDITIVES IN FOOD

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I. INTRODUCTION

The supply of abundant wholesome and economic food requires not only efficient production but also processing, preservation, storage and efficient transportation to minimize wastage and enable distribution to the consumers in far off places. Though the advent of heat sterilization and refrigerated storage has considerably changed the entire outlook in the methods of preservation, chemical additives play a very important role in the nation's economy of food. In the processing and preservation of food, their use is indispensable in maintaining the nutritional quality of food, in retarding the rate of deterioration due to bacteria, enzymes and chemical changes, to improve the aesthetic appeal and convenience of use and to provide essential aids in food processing. The purpose of this paper is to review the salient aspects of information available with regard to the use of intentional chemical additives in food, problems arising from their use and future considerations.

II. HISTORICAL ASPECTS

History of the use of chemical additives in foods dates as far back as 1820 when a German jew named Marcus came to England and wrote a 'Treatise on the adulteration of food and culinary poisons'. Like so many pioneers, he was bitterly attacked by those whom he exposed and he eventually returned to Germany as a disillusioned man. In 1848, Mitchell in England published a similar book but this time the alarm did not subside and in 1850, Wakely, at that time Editor of the 'Lancet' in England, formed a Sanitary Commission to look into these matters. His efforts over a period of years led to a Parliamentary Commission and later, the Food and Drug Act of 1860 was passed. Unfortunately, this became a dead letter and in 1872, a second Act was passed which was a notable advance. Since that time, there have been a number of amendments[1].

Many governments and their laboratories have been giving serious attention to the general principles governing the use of chemical additives in food and have been the subject of discussion at many national and international conferences[2]. In the United States, the National Academy of Sciences has focused attention on this problem. The Food and Agriculture Organisation (F.A.O.) and the World Health Organisation (W.H.O.) of the United Nations have been active in this field, approaching the problem from an international point of view.

In the United States, Miller's Committee and Delaney's Committee were appointed to go into the problems arising from pesticide residues and the use of chemical additives in food respectively. The Federal Food, Drugs and Cosmetic Act of 1906 was completely revised in 1938 and since then several major amendments have been made[3]. Early in 1958, in the congressional hearings in U.S.A. on the food additives problems, it was estimated that 700 to 800

chemical substances were being added to food in one way or another at that time. In the proposed and final listings of the substances generally recognized as safe in the levels used, more than 700 were identified. In addition, extensions were granted beyond March 1960 for more than 2,000 compounds employed prior to January 1958 in such a way that they came within the legal definition of food additives. These figures include direct and indirect additives[4].

III. WHAT IS A FOOD ADDITIVE?

In the strict sense of the term, food additives are chemical substances intentionally introduced into food to impart a desired quality. Insecticides, fungicides, rodenticides and other pesticidal agents used in agricultural practices may remain in foods as trace residues but these are regarded as incidental or unintentional residues. The Joint F.A.O. and W.H.O. Expert Committee defined 'Food Additives' as 'non-nutritive substances added intentionally to food, generally in small quantities, to improve its appearance, flavour, texture or storage properties'. Substances added primarily for the nutritive value such as vitamins and minerals are not considered in this category. Processing or transient chemicals such as caustic alkalies used in oil refining or lye peeling and subsequently removed by washing; diatomaceous earths or carbon used for decolourising or filtering purposes; or solvents volatalised during processing—all of which leave no residual components are not food additives. Drugs or growth stimulants (such as antibiotics and hormones) added to live-stock or poultry feed which may, intentionally or otherwise, leave residues in meat, milk or egg are regarded as food additives. No fundamental distinction can be made between food additives of natural origin and those produced synthetically.

IV. CHEMICAL ADDITIVES: THEIR NATURE AND USE IN FOODS

A. PRESERVATIVES

Preservatives are used to prevent infection or inhibit spoilage caused by bacteria, yeasts, moulds or other micro-organisms. They do not include common salt, saltpeter, sugar, acetic acid or vinegar, alcohol or potable spirits, spices, essential oils or any other substance added to the food in the process of curing or smoking.

The mechanism of microbial inhibition by preservatives has been reviewed earlier by Wyss[5]. Inhibitory action may be brought about by any one of the following means:

(*i*) By interfering with the genetic mechanism of cell division or with the permeability of the cell membrane.

(*ii*) With the enzyme systems of the microbe (*a*) by competition with the substrate for place on the active enzyme surface or (*b*) due to interference with the forward progress of an enzyme—catalyzed reaction by accumulating the end products of the reaction.

(*iii*) By inhibition of vitamin bio-synthesis (e.g. folic acid).

(*iv*) By the formation of complexes with heavy metal ions.

Preservatives are used to control microbial spoilage, chemical deterioration (e.g. antioxidants) and to control insects.[6] Microbial antagonists include inorganic and organic agents.

1. Inorganic Agents

Sulphur dioxide finds widespread use throughout the world principally in treating foods of plant origin. It is used in the

preservation of fruit juices, pulps, beverages and concentrates. Concentration used may vary from 350 to 2000 ppm. It has found wide use in the fermentation industries such as wine making[7] and is also used in controlling the enzymatic browning during drying of foods. In addition to acting as a preservative, SO_2 also helps in the prevention of non-enzymatic browning[6].

Soluble sulphite salts (e.g. potassium metabisulphite) are used in treatment of prepared apple slices, peeled potatoes, bananas and other fruits and vegetables to prevent browning. Sulphuring prior to dehydration not only protects certain nutrients and controls discolouration but is equally effective in controlling microbial and insect activity. Further-more, during the preparation of treated sulphured foods, SO_2 is largely eliminated in the form of gas which evolves during boiling or heating and is lost. Sodium sulphite has been used to a minor extent in preserving animal tissues but generally in combination with other agents. Presence of small concentrations of sulphur dioxide may help in protecting the fresh flavour in some fruit juices and vegetables which have delicate flavours[8]. The preservative action of sulphur dioxide is due to the free sulphur dioxide and not to the combined or total sulphur dioxide[9]. In plant products, various factors naturally present induce the effectiveness of free sulphur dioxide.

Pretreatment and preservation of fruit and vegetable products with sulphur dioxide and sulphites[10] and the chemistry of sugar-sulphite reaction and its relation to food problems[11] have been critically reviewed.

Hydrogen peroxide in concentration levels of 0.1 per cent or lower is effective. A proposed process for sterilising fluid whole milk involves the addition of 0.1 per cent H_2O_2 to the milk, allowing reaction time of several minutes for sterilization, adding catalase to decompose the residual hydrogen peroxide followed by heating to inactivate the enzymes and aseptic packaging.[2] The process has potentiality. The damaging influence of liberated oxygen has, however, to be overcome. H_2O_2 is also useful for surface sterilization of many commodities.

Chlorine[12] is widely used as chemical disinfectant for treatment of water and for processing purposes and is most effective at low pH values.

Carbon dioxide has preservative properties at high pressure and is used currently in controlling maturation and storage of fresh fruits which is an instance of physiological control.

2. Organic Antagonists

Sodium benzoate is widely used in preserving acid foods. It is more effective against yeasts and moulds than bacteria. As in the case of SO_2, its efficiency as a preservative is dependent on pH. In a food with a pH value near 7.0, benzoate is less effective than in an acid food of pH 3.0 or below (Table I).

TABLE I. *Effect of varying fungistat concentration and pH on sugar utilization by S. rouxii var. Polymorphus*[13]

Fungistat concentration	Sugar utilization (%)				
	at pH 6.0	5.5	5.0	4.5	4.0
0.025 % Benzoate ...	21	29	26	25	12
0.050 % „ ...	23	18	19	13	13
0.075 % „ ...	15	14	7	0	0
0.100 % „ ...	13	9	5	0	0

Esters of benzoic acid are more effective than benzoic acid and are suitable for use over a wide range of pH. By introduction of the side chain, the effectiveness of benzoate is considerably improved. p-Hydroxybenzoic acid is much more efficient as a

preservative than benzoic acid and the preservative power is considerably enhanced when esterified with lower alcohols. The preservative power of these esters increases with the increasing carbon chain of the alcohol moiety upto butyl ester after which it decreases[14]. The esters of p-hydroxy-benzoic acid are more active against yeast fermentation and is effective even at neutral pH as may be seen from the data given below[51]:

Preservative	pH	Test organism	Concentration of preservative needed
Sodium benzoate	4.5	S. cerevisiae	0.6 %
,, ...	6.6	,,	4.0 %
Ethyl p-hydroxy benzoate ...	4.5	,,	0.06 %
,, ...	6.6	,,	0.10 %

Benzoic acid occurs naturally in cranberries. p-Hydroxybenzoic acid is widely distributed in plant tissues and is a normal constituent of wine. p-Hydroxybenzoic acid and its esters have been permitted in Germany[16]. Methyl and propyl parahydroxy benzoates are permitted in the United States[16]. In India, sulphur dioxide and benzoic acid and their salts are the only two preservatives permitted under F.P.O.

Benzoates are commonly used in preserving tomato ketchup, apple cider, fruit juice squashes, fountain syrups, margarine, pickles and other acid foods. A combination of treatment with mild heating is complementary. Germicidal ice containing benzoic acid has been experimentally used in the storage of fresh fish[2].

Benzoates in foods at concentrations in excess of 0.1 per cent may be noticeable and can impart a disagreeable 'peppery' or burning taste to the food particularly in fruit juices.

3. Antibiotics

Certain metabolic products from micro-organisms have been found to have germicidal effects and are termed antibiotics. Though the miraculous development of penicillin gave a great impetus for the use of antibiotics in medicine, their application in food has been rather slow. Late in 1949, the work of Andersen and Michner revealed that 'subtilin' added in concentrations of 10 to 20 ppm combined with mild heat treatment exerted a marked preservative effect. Earlier work on the use of antibiotics in canning has been reviewed[17].

Combination of treatment with antibiotics along with other sterilizing agents, including heat and other means of radiation offer real promise. The application of antibiotics for non-medical uses is spreading. A pre-kill injection of antibiotic extends the storage life of fresh meat three to four fold[18]. The use of aureomycin has been permitted in the U.S.A. in the treatment of uncooked poultry to improve its distribution life in cold storage[19]. The American Cynamid Corporation has developed a process called Achronize process (dipping of poultry in chilled water containing antibiotic) and Biostat is the trade name given by Chas Pfizer and Co. to the food grade antibiotic Oxytetracycline. Residue tolerance of 7 ppm of chlorotetracycline has been permitted in the case of uncooked poultry. The effectiveness of the six antifungal antibiotics in inhibiting the growth of common food spoilage fungi has been evaluated[20].

Antibiotics for use in food must satisfy certain requirements. It must have no harmful effect to man when taken by mouth and preferably should be metabolizable or at least digestible and be eliminated from the body. They should be made use of when no other method is feasible, should be easy to use, reliable and economic. Reliable method of control and detection must exist. The antibiotic must be compa-

tible with other methods of permanent preservation and should have a wide spectrum of action against spoilage organisms.

Hitherto, research for new antibiotics has been limited to clinical uses. It is only when the antibiotic studied was of no clinical value that other uses were considered. Specific search for antimicrobial agents capable of destroying or inhibiting spore forming anaerobic bacteria may yield promising results.

B. MOULD INHIBITORS

Fatty acids containing from 1 to 14 carbon atoms are effective mould inhibitors[2,14]. The presence of double bonds increases their preservative effect. Branching of chain lowers it. Propionates can be extremely useful in controlling the mould and ropiness in bread and also in pickles. Low temperature and low levels of micro-organisms permit efficient preservative action at low concentrations.

In addition to using sodium or calcium salts of propionic acid in various foods, their application in packaging material is also being explored.

Sorbic acid is a fungistatic agent and has been found most useful in controlling growth in packaged cheese[21,22], meat and in fermentation industry[13]. Inhibitory influence exerted by sorbic acid on mould growth is due to the inhibition of the dehydrogenase enzyme systems in moulds[23]. At low levels of mould growth, sorbic acid has been found to exhibit fungistatic and may even effect fungicidal effect, while at high levels, it is metabolised and does not appear to have any inhibitory influence.

Dehydroacetic acid is a promising antimicrobial agent. The preservative action varies slightly with pH and has application in many perishable foods. At low concentrations, it imparts no objectionable flavour and is also effective. It is permitted in U.S.A. for use on strawberries more as a pesticide[2].

Peracetic acid is useful in the control of certain microbial contaminants. 0.1 per cent solution sprayed on grapes and raspberries has been found experimentally to delay moulding[24] and has also been experimentally used for treatment of shell eggs.

C. ANTIOXIDANTS

Antioxidants are used to retard or prevent oxidative deterioration, rancidity in fats and oils or development of off-flavour in frozen foods, flavouring oils, beverages, etc.[25] They are of specific value in retarding or preventing spoilage of foods containing fats and oils. Rancidity may develop as a result of oxidative, hydrolytic or ketonic degradation accelerated by air, light, heat, moisture and/or presence of metals (pro-oxidants)[6]. In the presence of antioxidants, the energy, which activates the fat molecules and makes them reactive with oxygen to produce activated peroxides, appears to be taken up by the antioxidant, thus preventing the chain reaction which results in the development of rancidity[6]. The efficiency of the inhibitor is considerably reduced if added to fats in which peroxides have already been formed, since the reactive peroxides already present rapidly oxidise the small amount of inhibitor added. The presence of metal catalysts may destroy the efficiency of an antioxidant by rapidly catalysing its oxidation.

The phenolic and acidic substances that inhibit oxidative deterioration are antioxidants and synergists. The antioxidant substances are phenolic compounds and exert primary anti-oxidative action. The synergists usually are di- and poly-basic acids that serve to sequester the pro-oxidant metals.

Since vegetable fats and oils have a high tocopherol content, they are more stable

than animal fats and need lesser amounts of the phenolic oxidant compounds.

Oxidation, in addition to the foods rich in fats and oils, may also occur in other class of foods resulting in discolouration or development of off-flavour. Ascorbic acid, sodium ascorbate and isoascorbate are used to assist the development and stabilization of the desired colour in cured meats. Enzymatic browning which may occur in such fruits as apples, apricots, bananas, cherries, peaches, pears and potatoes may be prevented by the use of ascorbic acid or citric acid.

Antioxidants generally used in various classes of foods are given below[28]:

Coal-tar dyes are most widely used for the artificial colouring of foods. Synthetic dyes have often been referred to as 'coal-tar dyes' (because of the use of coal-tar as a starting material) or 'aniline dyes' (because aniline is an intermediate in the manufacture of colours)[27,28]. The certified colours generally used in foods fall into six classes (*i*) Azo dyes, (*ii*) Triphenyl methane compounds, (*iii*) Pyrazolone dyes, (*iv*) Nitro-derivatives, (*v*) Indigoid compounds and (*vi*) Xanthene based dyes. Every dye molecule contains certain group of atoms which has strong influence in making the substance a dye and the group is called a chromophore as

Food	*Antioxidant Used*
(*a*) Lard, vegetable oils and hydrogenated shortenings, crackers and biscuits, breakfast cereals, dry cakes and soup mixes	(*a*) Nordihydroguiaretic acid (NDGA), propyl gallate, butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA) or lecithin and tocopherol
(*b*) Cooked, cured or comminuted meat products, frozen fish, beer, flavouring oils and emulsions and confectionery	(*b*) Ascorbic acid and isoascorbic acid and their sodium salts, ascorbyl palmitate, lecithin and tocopherols
(*c*) Wine, beer and sugar syrups. Cut, peeled or dried fruits and vegetables	(*c*) Sulphur dioxide and sulphites

D. COLOURING MATTERS

The colours used for colouring of foods may be divided into three groups[26,28] (*i*) natural colours, (*ii*) inorganic colours which may be synthetic or of mineral origin and (*iii*) synthetic colouring matter. Natural colouring matters may be of animal or plant origin. The different natural colours, their source and the colouring constituent are given in Table II.

None of the inorganic colouring matter which may be either found as such in nature or prepared synthetically is permitted for use in food.

it is the characteristic colouring group. When the chromophore enters into a combination or becomes part of a large molecule, it is called a chromogen. Though chromogen is a highly coloured substance, it is latent, and is converted into a dye by the addition of a salt-forming group termed auxochrome or colour-fixing group. This is usually an amino group in the case of basic dyes and a hydroxyl or carboxyl group in the case of acid dyes.

Actual chemical dyeing does not take place when the food is artificially coloured but mostly become stained by a mechanical

TABLE II. *Natural organic colouring matter*

Colour	Source	Colour constituent
1. Alkanet ...	Roots of *Anchusa tinctora*	Alkanin ($C_{16}H_{16}O_5$)
2. Annatto ...	Fruits of the shrub *Bixa orellana*	Bixin ($C_{25}H_{30}O_4$)
3. Betanin ...	Beet root	Betanin ($C_{21}H_{23}O_{10}N_2Cl$)
4. Caramel ...	By heating sugar above melting point	
5. β-Carotene ...	By synthesis	
6. β-apo-8′-Carotenal ...	By synthesis	
7. Chlorophyll ...	Leafy matter	Chlorophyll a ($C_{55}H_{72}O_5N_4Mg$) Chlorophyll b ($C_{55}H_{70}O_6N_4Mg$)
8. Cochineal ...	*Coccus cacti* insects	Carminic acid ($C_{22}H_{20}O_{13}$)
9. Saffron ...	*Crocus sativus*	Crocetin ($C_{20}H_{24}O_4$)
10. Turmeric ...	*Curcuma longa*	Curcumin ($C_{21}H_{20}O_6$)

combination or absorption of the colour on the substance. Exceptions do exist as in sausage casings, where there is an actual affinity between the dye and the animal tissue which is probably due to the combination of the amino group of the animal tissue with the sulphonic or acid group of the dye.

The coal-tar dyes exist in three different forms—powders, pastes and lakes. Straight or primary colours are in powder form. Purity ranges from 86-94 per cent in the case of water-soluble dyes and not less than 99 per cent in the case of oil-soluble dyes. The balance is primarily moisture and sodium chloride. Pastes are mechanical mixtures of dye colours in such diluents as glycerol or glycerol and water with powdered sugar added as thickening agent. Pastes are useful for candies where further addition of water is undesirable. Lakes are certified colours precipitated on a suitable mordant such as aluminium, potassium, sodium, etc. They are not permitted in foods except for the colouring of shell eggs as the colour is removed along with the shell and does not become a component of food on which it is used. Mixtures (also known as blends or secondary shades) are sold with or without diluents like salt and sugar. Mixtures containing no diluents are termed basic strength.

All the water-soluble colours are acid dyes and with the exception of erythrosine all are sulphonates. The acidic character of erythrosine is due to the carboxyl group. The insolubility of oil-soluble colours in water is largely due to the lack of a salt forming group.

The amount of sodium chloride in the dry colour affects the solubility. If blends contain salts as diluents, solubility is considerably decreased. Addition of salt in sufficient quantity to the colour solution precipitates the colour. Alcohol when used as preservative decreases the solubility. The oil-soluble colours are soluble in chloroform, halogenated solvents and to some extent in aliphatic hydrocarbons.

The fastness of the colour varies with (*i*) the dye, (*ii*) the nature and the intensity of the light and (*iii*) the amount of moisture present in the medium in which the colour is used. Dyes have the ability to take up hydrogen and get reduced to colourless compounds. Nitro and azo dyes give rise to amino-compounds while others are converted to leuco compounds which contain two atoms of hydrogen more than those in the original dye. They regain colour on oxidation.

Most of the food colours are unstable in the presence of oxidising or reducing agents although the red colours are relatively more stable. In the canned products containing added dye, the acid acts on the metal of

the container and liberates hydrogen, which in turn reacts with the colour to cause reduction, resulting in the loss of colour. The stability of colours in the presence of acids varies with different class of dyes. Azo dyes are comparatively stable in weak acids. Indigotine fades rapidly in acid medium and erythrosine fades completely in acid medium.

Problems encountered in the use of coal-tar dyes and their causes are summarized below[29]:

In addition to the problems stated above, a few more problems may be encountered. Coal-tar dyes may undergo reduction in the presence of ascorbic acid in foods which may be inhibited by the use of EDTA (Ethylene diamine tetraacetic acid)—a chelating agent. F.D. & C.dyes do not withstand high temperature in products rich in protein. The rate of corrosion of can is proportional to the concentration of azo dyes. A concentration of 50 ppm can be used with assured shelf-life upto 12 months.

Problem	*Causes*
1. Precipitation from colour solution or coloured liquid food	(*i*) Exceeded colour solubility limit (*ii*) Not used enough solvent (*iii*) Result of a chemical reaction (*iv*) Employed low temperature in the preparation of concentrated solution
2. Dull shade instead of bright pleasing shade	(*i*) Used too much colour (*ii*) Exposed to high temperature
3. Specking and spotting during colouring of bakery and confectionery products	(*i*) Not dissolved the colour completely while making solution (*ii*) Used liquid colour containing sediment (*iii*) Tried to disperse an aqueous colour solution in products containing too much fat
4. Fading due to light	Exposure of coloured product to sunlight
5. Fading due to metals	Due to contact of colour solution or coloured product with certain metals (zinc, tin, aluminium, etc.) during handling and storage.
6. Fading due to microbes	Contamination due to improper cleaning
7. Fading due to excessive heat	Used higher processing temperatures
8. Fading due to oxidising agents	Contact of colour with oxygen, ozone, hypochlorites or reducing agents such as sulphur dioxide and ascorbic acid
9. Fading due to strong acids and alkalies	Presence of such strong chemicals during colouring of certain foods
10. Fading due to reaction with protein material	Used colour not possessing good stability under these conditions

Coal-tar dyes permitted for use in India under F.P.O.[30] are given in Table III.

TABLE III. *Coal-tar dyes permitted for use in fruit products***

Colour	Common name	Colour index	Chemical class
1. Red	Ponceau 4 R	185	Azo
	Carmoisine	179	,,
	Red 6 B	57	,,
	Red FB	225	,,
	Acid Magenta II	692	Triphenyl-methane
	Fast Red E	182	Azo
	Amaranth	184	,,
	Erythrosine	773	Xanthene
2. Yellow	Tartrazine	640	Pyrazolone
	Sun set yellow F.C.F.	*	Azo
3. Blue	Blue VRS	672	Triphenyl-methane
	Indigo carmine	1180	Indigoid
4. Black	Brilliant black	BN	Bisazo

* F.D. & C. index No. 6.

** Maximum limit of any permitted coal-tar colour or mixture which may be added to any fruit product shall not exceed 0.46 g./Kg.

The F.P.O. list of permitted colours contains only 13 synthetic dyestuffs of which 8 are sulphonated azo compounds, the rest being triphenylmethane (2), xanthene (1), pyrazolone (1), and indigoid (1) compounds. Appearance plays an important part both in the selection and appreciation of food. The manufacturer, therefore, is anxious to obtain the right shade of colour. The use of colour is not an important item of cost so that provided the permitted colours possess the properties required of them, the food manufacturer is unlikely to change the colour unless technological advances in the colour field require such a change. One may conclude, therefore, that once a list of satisfactory colours is established, there will be little agitation to add to it and the main wish of the user will be that it does not suffer amendment at constant intervals.

Thirty synthetic coal-tar dyes have been permitted for use in foods in U.K. The various dyes have been classified into three classes—A, B and C—based on their toxicological evaluation. The particulars are given below[31]:

A. Colours—Those which, from the available evidence, would seem unlikely to be harmful when consumed in foods, in the customary amounts.

B. Colours—Those for which the available evidence is deficient or conflicting, although there is no apparent reason on structural or other grounds to expect them to be harmful in the amounts ordinarily consumed.

C. Colours—Those which have been shown, or are suspected, to have harmful effects on health (non-permitted category).

The permitted colours in U.K. fall into the class A or B and none from C.

In the eight red colours permitted under F.P.O., only erythrosine comes under B classification. This is not useful for overall application. In fact the instability of erythrosine is the main reason for its application in the canning of cherries, since the acidity of the fruit juice precipitates the dye from the syrup on to the flesh of the fruit. But for the specific purpose mentioned they are irreplaceable. Acid Magenta II, a triphenylmethane dye, though falls into A category is permitted in only a few countries and has not found much acceptance in the formulation[32]. Chemically, the remaining six reds fall into the azo dye category as also the yellow colour Sunset yellow F.C.F. and the bis azo dye Brilliant Black.

Not one orange colour appears as such on the F.P.O. list although Sunset Yellow, which falls under A category and appears under yellow is actually better described

as orange. Considering the wide variation of colour in such products as orange squash, a manufacturer is compelled to use a blend. Difficulty may arise by way of colour stability as the constituent colours can vary in susceptibility to light, heat, acid and other conditions, so that what starts off as an attractive orange squash may deteriorate into a rather yellow or dull brown product. Alternately preferential adsorption of the dye onto the pulp may take place so that the latter is tinted red in comparison with the rest of the contents. In addition to the Sunset Yellow F.C.F., another permitted yellow colour is Tartrazine which is a pyrazolone dye and falls under A category.

Of the two blues, Indigocarmine and Blue VRS, the former is unstable and the latter does not give a satisfactory colour particularly in the colouring of green peas and, therefore, trouble arises once again due to blends. Both the dyes fall under A category. Blue VRS, however, finds very little acceptance outside the Commonwealth[32].

The net result of the regulation is the difficulty in compounding colours which will meet the requirements of individual products. Natural colours make a substantial contribution to the colouring of foods, particularly, the fat-based foods. Annatto and carotene are generally made use of for this purpose. Their use, however, requires considerable standardization with regard to the strength and factors such as resistance to heat and alkaline conditions have to be taken into account.

E. EMULSIFIERS, STABILIZERS AND THICKENERS[33,34]

Additives used to give and/or maintain desired texture in a food are called stabilizers, thickeners and emulsifiers. The distinction between these three types of additives is not always clearly defined, as in some cases, an additive may perform more than one of these functions. Emulsifying agents are used to permit the dispersion of tiny particles or globules of one liquid in the other which under ordinary circumstances will not mix (e.g. oil and water). Use of these additives enable preparation of smooth stable mixtures of substances immiscible by ordinary means. They also have a shortening effect, so called 'fat extending effect', which enable the use of only a small percentage of fat than what is actually required as in the case of bakery products. The above properties have been made use of in (*i*) preparation of emulsions, (*ii*) dispersion of flavours or vitamins in oils and other products, (*iii*) bakery products—cakes, biscuits, etc., (*iv*) confectionery products —candy, frostings, marshmallow, etc., (*v*) ice cream, salad cream, mayonnaise, gravies, pickles, flavourings, margarine and chocolate milk, (*vi*) production of foams and aerosols, (*vii*) antifoams and (*viii*) aerosol insecticides.

Commercially available emulsifying agents may be classified as (*i*) anion-active agents, (*ii*) cation-active agents, (*iii*) nonionic agents and (*iv*) miscellaneous agents which include natural or modified agents and finely divided solids.

The important group of surface-active agents from the food chemists point of view comprises of nonionic agents. Acids and bases which may occur are the following:

Bases	*Acids*
Glycerol	Lauric (not permitted in U.S.A.)
Ethylene glycol	
Propylene glycol	Oleic
Sorbitol	Palmitic
Polyoxyethylene	Stearic
Mannitol	
Penta-erithrytol	Acetyl tartaric
Polyglycol	
Morpholine	

Agents used in food are combination of two or more of the following basic materials:

(*a*) Sorbitans—anhydrides of sorbitol.

(*b*) Fatty acids of the normal aliphatic series usually in mixtures.

(*c*) Polyoxyethylene with varying degree of polymerization.

Combination of the above basic materials offers a wide range of possibilities but the most important groups are the following:

(*i*) 'Spans'—fatty acid esters of sorbitans (a plus b)

(*ii*) 'Tweens'—fatty acid esters of sorbitans combined with polyoxyethylene (a plus b plus c)

(*iii*) 'Myrjs'—fatty acids esterified with polyoxyethylene (b plus c)

Additives and the products in which they are used are given below:

Additive	*Used in*
Mono- and di-glycerides of fatty acids	Lard, margarine, shortenings, etc.
Acetyl tartaric, sulphoacetate, monosodium phosphate derivatives of mono- and di-glycerides	Ice cream, frozen desserts, chocolate, confectionery, bread and other baked foods, cake mixes, etc.
Glyceryl lactopalmitate, sorbitan, ethylene and polyoxyethylene, sorbitan derivatives of fatty acids	Flavour emulsions and concentrates, vitamin concentrates.

The main function of these agents in food are in connection with the preparation of emulsions, dispersion of flavours and vitamins in oils or other products and not as mere fat extenders. Accordingly, these find application in the confectionery and bakery trades, in cakes, ice cream, salad cream and many other similar products. The same type of compound may function as emulsifier, detergent, wetting or foaming agent. It is necessary, therefore, to consider which substance is appropriate to the particular food product. These additives should not be used in foods without adequate evidence of harmlessness[3].

In addition to these, well-known substances like lecithin, alginate, gums, irish-moss, cellulose ethers, etc., which fall under this category find extensive use in various foods. Thickening agents are used to impart body or thickness to fluids or emulsions[33-35].

Example	*Used in*
1. Glycerol, sorbitol, gelatin	Processed cheese, salad dressing, ice cream and frozen desserts
2. Pectin and vegetable gums (alginates and karaya gum)	Chocolate flavoured milk and syrups
3. Cellulose gums (carboxy methyl cellulose)	Confectionery and icings, low-caloric (non-sugar) beverages, canned fruits and pressure dispensed creams.

The texture and flavour of many foods depend on small amounts of added stabilizers. If stabilizers are not added to chocolate milk, particles of chocolate tend to settle to the bottom of the bottle or glass. Stabilizers thicken the milk slightly and thereby prevent the separation of chocolate solids. Similarly, in commercial ice cream and other frozen desserts, stabilizers are often used to increase the viscosity of the ingredients and help prevent the formation of large coarse crystals which would make the frozen product less smooth to taste.

F. MATURING, BLEACHING AND CONDITIONING AGENTS

Flour in its natural freshly milled state has a yellowish tint due to the presence of carotenoid and other pigments. The aging process during storage bleaches the colour and the resulting flour, in addition, has enhanced bread-making qualities. Chemical additives incorporated into the flour have been found to have similar effect. Oxidizing agents incorporated into the flour in small amounts bring about rapid improvement in colour and bread-making properties, thus reducing the storage period and hazards associated with it. Maturing and bleaching agents help to smoothen out wide variations encountered in bread wheats and enable the miller to produce a standard and relatively uniform product. Conditioners improve elasticity and stability of doughs and facilitate manufacture of products of uniform quality in mechanical baking. Some of the permissible agents used are outlined below[27,35]:

Chemical	*Used in*
Oxides of nitrogen and benzoyl peroxide	Acts as bleaching agent and has no influence in baking properties; used in wheat flour
Chlorine, chlorine dioxide, and nitrosyl chloride	Wheat flour—has both bleaching and maturing or improving properties
Potassium bromate	Has only a maturing effect—used in wheat flour

Bleaching agents may be used to achieve the desired colour in the production of traditionally white coloured cheese and for neutralizing the colour present naturally in fats and oils[3].

Leavening agents are used to render batter or dough light and porous as in fermentation. The agents generally used are given below[35]:

Chemical	*Used in*
Sodium bicarbonate (and to a lesser extent calcium or ammonium carbonates) plus an acid salt (alum, monocalcium phosphate, sodium acid pyrophosphate, potassium acid tartarate) or acid producing compound (glucose-d-lactone)	Self raising flour, cake mixes, cakes, biscuits and crackers

A variety of light cakes, biscuits, waffles, muffins and many other baked products prepared from leavened flour, has been made possible by the use of acids and alkalies that make up baking powder and baking soda. Sodium bicarbonate (baking soda) when heated yields CO_2. The residual sodium carbonate imparts a soapy taste unless the food also includes an acid ingredient[35].

Baking powder consists of three basic ingredients, sodium bicarbonate, an acid salt and starch as a filler. When water is added, the acid reacts with sodium bicarbonate to release CO_2. The residue is a tasteless salt. The rate at which the reaction takes place depends on the acid salt used[3].

G. ACIDULANTS, NEUTRALIZERS AND BUFFERS

Acidity or alkalinity of a food often affects the flavour, texture and cooking quality. Substances which are added to food to control the acid alkali balance include acids, alkalies, neutralizing agents and buffers. These additives have important functions in the preparation of dairy, confectionery, fruit and vegetable products. Acidulants impart acid or tart taste to juices and beverages, permit effective heat processing of canned vegetables without discolouration, compensate for insufficient acid in fruits when making jams and jellies and impart desired texture and tartness to cheese spreads and processed cheese. Acids and alkalies are useful in peeling tubers, fruits and vegetables. Buffering agents are used to adjust and stabilize pH while neutralizers are used to correct excessive natural acidity. Additives used for the purpose are given below:

Additive	*Used in*
Acids—citric, malic, lactic, tartaric and other acids	Soft drinks, squashes, juices and other beverages and confectionery products.
Buffers—sodium salts of the above acids (e.g. sodium citrate)	In dairy products for adjusting the acidity and for controlling the souring of cream.
Calcium, potassium and magnesium sulphates with phosphates, lactates and chlorides	Used for adjusting the mineral content and for controlling the degree of acidity of brewing water.
Neutralizers—Na, Ca or Mg hydroxide; Ca or Mg Oxide	Sour cream, butter and other dairy products; canned olives, tomato soup and wines.

Neutralizers are used to remove excessive acids formed during production, preparation or processing of foods. Several new phosphates have become important for this purpose during the past 25 years in addition to the such standard compounds as bicarbonates, citrates, tartarates, hydroxides, and others[27].

H. FLAVOURING AGENTS

Flavouring Agents are used to impart or enhance flavour or aroma in foods. Flavouring agents used are generally the following[28]:

Example	Used in
(*i*) Natural extracts, essential oils and oleoresins	(*i* & *ii*) Soft drinks, confections, chewing gums, gelatin desserts, ice creams, frozen desserts, baked goods, icings
(*ii*) Alcohols, aldehydes, ketones, ethers and esters	
(*iii*) Monosodium glutamate, pyroligneous acid and flavour nucleotides[86a-c]	Meat products and sauces

Natural or synthetic flavouring agents are used in candies, carbonated beverages and many other foods. Natural flavours include spice and essential oils such as clove, ginger, pepper and citrus oils. Aromatic chemicals are used to impart pineapple, cherry, walnut, wintergreen and many other flavours.

Flavour enhancers are substances which do not add flavour themselves, but rather bring out the natural flavour of the food to which they are added. Pfizer's 'Veltol' is now gaining recognition as a sugar sparing additive as well as flavour intensifier. Its action has been demonstrated in lemonade and limeade and canned orange, grape fruit and pineapple juice. Similarly, monosodium glutamate enhances the flavour in meat products, soups, sauces and other savoury dishes. 5'-Ribonucleotides, inosinic acid and guanilic acid have been used as new food seasonings and remarkable progress has been made in Japan in this regard.[86 a-c]

I. ARTIFICIAL SWEETENING AGENTS

Non-caloric sweeteners are used to impart sweetness in place of sugars.[28,34]

Additive	Used in
Saccharin and cyclohexyl sulfamates (calcium or sodium salt)	Low-caloric diabetic foods such as beverages, canned fruits and vegetables, frozens desserts, gelatins, jams, jellies and marmalades, baked goods, salad dressings and frozen fruits.

J. SEQUESTERANTS

Sequesterants are used to 'trap' trace metals (especially iron and copper) which adversely affect colour, clarity, flavour or stability and are also used in the production of shortening. Many fats and oils contain traces of such minerals as copper and iron which themselves do not cause rancidity but act as catalysts to hasten the oxidative rancidity of fat or oil. Sequesterants combine with these metals and make them inactive. The additives used for the purpose are generally the following:

Additive	Used in
Monoisopropyl citrate, stearyl citrate and citric acid	Oleomargarine and salad oil
Sodium hexametaphosphate	Water supplies to prevent scale formation and corrosion
Phosphoric acid	Rendered animal fat or a combination of such fat and vegetable fat
Phytic acid and EDTA (Ethylene diamine tetra acetic acid)	Preserves and wines to prevent blackening from iron contamination

K. HUMECTANTS

Humectants are used to absorb or retain moisture in certain foods such as shredded coconut, marshmallows, pastilles and jelly like candies, dried food and confections. Glycerol, propylene glycol and sorbitol are used as humectants.

L. FIRMING AGENTS, TEXTURIZERS, ETC.

These agents are used for improving texture or firmness of the processed products[35]. These act by combining with pectic acids to form insoluble pectates and thus harden the structure.

Additive	Used for
Aluminium sulphate and aluminium potassium or sodium sulphate	Firming agents used in sweet and dill pickles
Calcium carbonate	Firming agent
Calcium chloride	Cheese, canned potatoes, sliced apples and other fruits and vegetables
Calcium gluconate	Firming tomatoes and apple slices
Magnesium chloride	Canned peas

M. ANTICAKING AGENTS AND DESICCANTS

These are used to prevent lumping and caking in hygroscopic foodstuffs[27,35].

Additive	Used in
Mannitol	Antisticking agent used in chewing gums (1.0 per cent)
Calcium or magnesium stearate	Anticaking agent in onion and garlic salt or powders
Talc	Added to vitamin supplements to render them free flowing
Calcium carbonate	Used in hard candies to prevent sticking
Calcium phosphate tribasic	Used as anticaking agent in table salt, powdered sugar and malted milk powder
Silica gel and starch	Used as desiccant

N. MISCELLANEOUS ADDITIVES USED IN FOOD PROCESSING[2,27,35]

Aerating agents are used to charge with gas or for displacing air.

Additive	Used in
Carbon dioxide	Corbonated beverages
Nitrogen	Packing of oxidized oils, milk powder, egg powder, fruit juice powders and dehydrated fruits and vegetables
Nitrous oxide	Pressure dispensed creams, etc.

Clarifying agents are used to remove or prevent turbidity.

Additive	Used in
Pectinases	Fruit juices and vinegar
Tannin, gelatin, albumin and methyl cellulose	Chill proofing of beer
Proteolytic enzyme (papain, bromelin)	

Foam regulators (foaming or whipping agents and foam inhibitors) are used to stabilize or depress foam (antifoam agents).

Additive	Used in
Gum arabic, dextrin, peptones and cellulose gums	Beer for stabilizing the foam or retaining the head
Cellulose gums like methyl cellulose etc., albumin, modified proteins, and glycerides of fatty acids	Preparation of fruit juice powder by foam mat drying—used as foam stabilizer
Silicones (dimethyl polysiloxane)—antifoaming agent	Boiling of syrups and jellies, fermentation of wine or bottling of fruit juices, beverages, etc., to prevent foaming
Cetyl alcohol	To prevent foaming in fermentation industry

Hydrolysing agents are used to affect hydrolytic clevage of proteins, carbohydrates and cellulosic materials.

Additive	Used in
Hydrochloric acid and potassium acid tartarate	Manufacture of gelatin, protein hydrolysate sodium glutamate, invert sugar, corn syrup etc.

Curing agents: Salt is generally used in the brining of fruits and vegetables. Salt and certain other curing compounds are used in curing ham, bacon and many other meats such as frankfurters, etc. Curing agents may modify the flavour and also stabilize the characteristic colour. Additives used are the following:

Additive	Used in
Sodium or potassium nitrite and nitrate	Used for obtaining the pink colour in cured meat
Phosphates (disodium phosphate, sodium hexametaphosphate, sodium tripolyphosphate, tetra sodium pyrophosphate and sodium acid pyrophosphate)	Used for increasing the water holding capacity of cured meat and for increasing the retention of meat juice

V. PROBLEMS ARISING FROM THE USE OF CHEMICAL ADDITIVES IN FOOD

In the earlier paragraphs, various chemical additives intentionally used in the processing of foods were discussed. The chemical additives may give rise to various toxicological effects which have to be carefully studied before they could be permitted in foods. The magnitude of disturbance caused by the chemicals is evidently dependent on the nature of the substance and on the amount present per unit weight of the body. Toxicological problems arising from their use are discussed in the following paragraphs.

A. PRESERVATIVES AND ANTI-MICROBIAL AGENTS

Some weak acids such as benzoic, sulphurous, propionic, salicylic, sorbic and their derivatives are used as preservatives and are chiefly effective in the molecular form of the undissociated acid. The amount of preservative needed to produce a given effect depends directly on the pH, increasing with a decrease in the pH value. The proportion of undissociated molecules and hence the preservative effect is likely to be eliminated as the pH approaches two units higher than the pK value of the acid[36]. Hence acids with relatively high dissociation constants, e.g. salicylic acid, are useful only in highly acid foods, while for neutral foods weak acids of low dissociation constants such as dehydroacetic acid or boric acid are preferable but are toxic[36].

Benzoic acid has been extensively studied. It is rapidly and quantitatively excreted in urine, about 90 per cent appearing as hippuric acid after conjugation with glycine and the rest as a glucuronide-1-benzoylglucuronic acid[14,37]. Upto 10 g. of the benzoate is quantitatively excreted by man and 4 g. daily have been tolerated over long periods[38]. Very high levels of benzoate may, however,

become a drain on the 'glycine pool' of the body resulting in certain biological malfunctions. The lower aliphatic esters of benzoic acid will be hydrolysed by esterases which abound the intestinal wall and the liver. Detoxication mechanism will, therefore, be exactly the same as with equivalent quantity of benzoic acid with a minor additional task of oxidising a lower alcohol[37].

Substitution on benzoic acid may cause changes in the metabolism. *Ortho*-substituted benzoic acids do not combine to any extent with glycine—the main detoxicating route in man. It is believed that some of these *ortho*-substituted compounds may remain unchanged for long in the body[39]. On the other hand, conjugation with para-substituted benzoic acids proceed as readily as that with benzoic acid itself. In man, para-hydroxybenzoic acid is excreted partly unchanged and partly conjugated with glycine[40]. The free hydroxybenzoic acid in the urine probably arises from a dissociated glucuronide that may be circulating in the blood.

Sulphur dioxide and sulphites are the other permitted preservatives. Sulphurous acid is eliminated as sulphites in the usual way[14]. Men receiving repeated doses of 1-4 g. on several successive days showed abdominal discomfort[37]. Some sulphate is absorbed after these big single doses and 1 per cent of the dose could be found in urine fifteen minutes after administration. Sulphite in stored foods may be more toxic as compared to sulphite fed in drinking water[37]. Present legislation in many countries, however, assumes the toxic action of sulphur dioxide as a function of the total quantity present. In practice, a large part of this may be present in the combined form with glucose or exist as aldehyde sulphonates. These, however, have been shown to be neither more nor less toxic than sulphites[37].

In contrast to the sulphites, nitrites are toxic and if absorbed can reduce haemoglobin to methaemoglobin which is useless as a vehicle for transporting oxygen[37]. Spinach grown in high nitrogen soils has a high content of nitrate. Purees obtained from such leaves show considerable nitrite content on standing (due to reducing atmosphere). These when fed to the infants have been shown to cause methaemoglobin anemia with cyanosis[41].

Sodium diacetate, propionic and sorbic acids or their salts used as preservatives or antimould agents are relatively free from objection on toxicological grounds. Propionic acid is non-toxic upto a dose of 3.0 per cent of the diet. β-oxidation of the propionic acid in a manner similar to the oxidation of fatty acids in the body would give rise to pyruvic acid, a very common intermediary metabolite in the body[14]. Sorbic acid is primarily effective against fungi[42] and some yeasts[43]. In the course of digestion, sorbic acid is metabolized in the same way as naturally occurring caproic and butyric acids and is converted into pyruvic acid. Sorbic acid may, therefore, be considered as least toxic[44,45]. In spite of its harmlessness, sorbic acid has not been permitted for use in this country.

Dehydroacetic acid has been extensively studied in the animals and to a limited extent in man[46]. It has been rejected by American authorities on account of its acute toxicity. Formic acid and formaldehyde have irritant effects and may cause retinal damage[37]. Formates, on the other hand, are probably rapidly and harmlessly metabolized and their toxicity to mammals has not been reported. Boric acid in large dose is undoubtedly toxic as it has been found to produce dispepsia[37]. Borates cannot be metabolized and are only slowly excreted[37]. Toxicological data of some of the commonly used preservatives are given in Table IV[47].

There has been considerable apprehension in this country to permit the use of

TABLE IV. *Toxicological data of preservatives and antimould agents*

Benzoic acid ...	No toxic difficulty	Occurs widely in nature. Eliminated in conjugation with glycine.
Sulphurous acid ...	$LD_{50} = 0.3 - 0.7$ g./Kg. Slight chronic toxicity in high doses	Rapidly excreted. Small amount of salts may be oxidised.
Boric acid ...	Cumulative effect – 15-20 g. fatal to adult, 5 to 6 g. fatal to infant	Excreted only very slowly.
Formaldehyde ...		Irritation and ulceration of the membrane of the digestive canal.
Dehydroacetic acid ...	$LD_{50} = 0.5$ g./Kg.	Chronic toxicity in amounts too near the dose necessary for the successful preservation of food. In concentrations higher than the dose permitted for use in food, succinic acid dehydrogenase activity is inhibited.
Salicylic acid ...	$LD_{50} = 0.5 - 0.9$ g./Kg.	Excreted only slowly—causes liver and kidney injury. At 0.1% concentration pepsin activity is inhibited and completely suppressed at 0.4% concentration.
Sorbic acid ...	No toxic problems	
Propionic acid ...	,,	
para-Hydroxybenzoic acid ...	,,	
Monochloroacetic acid ...	Acute toxicity comparable to that of recognized poison like mercuric chloride	
Hexamethylene tetramine ...	Splits into formaldehyde *in vivo*	

mixed preservatives. The use of combined preservatives may not only improve the effectiveness of the preservative but may also reduce the dosage required. It is quite likely that even though the use of combined preservatives is not permitted, sulphite and benzoate may be consumed through different items of preserved food. The detoxication mechanisms of these two preservatives are different and when used in mixture, one does not interfere with the other. It has also been experimentally proved that when rats are fed with a mixture of 875 ppm of SO_2 and 2500 ppm of sodium benzoate (which dose is abnormally high as compared to the 40-45 g. of body weight of rats used), mixed preservatives had no deleterious effect on the growth and health of albino rats as compared to the control groups containing one of the two preservatives or with no preservative[48]. In view of these findings, permitting the use of combined preservatives is strongly advocated.

B. ANTIOXIDANTS

Phenols constitute the largest and most important class of antioxidants. According to Mitchell[49], butylated hydroxy anisole (BHA) constitutes 55 per cent of the total antioxidants used in foods in the U.S.A., butylated hydroxy toluene (BHT) about 25 per cent and propyl gallate 20 per cent. Nordihydroguairetic acid is used only to a limited extent because of its low heat stability, low solubility in oil and relatively high cost.

Antioxidants for use in food should be soluble in fats, remain unchanged when heated, impart no foreign colour, odour or flavour to the fat even on long storage, prevent deterioration of the product for at least a year after storage at 75-85°F in unsealed containers and preferably possess carry over properties in the prepared products[50]. Though many chemicals satisfy the physical and chemical properties

specified, some of them are toxic. Not only the original antioxidant but the oxidation products should also be non-toxic.

Little work appears to have been carried out on the metabolism of antioxidants. Gallates are not metabolized in the intestinal tract[61]. After a single oral dose of 1 g. of BHA to the rabbit, 46 per cent was excreted as glucuronides, 9 per cent as etherial sulphates and 6 per cent as free phenols[52]. In rabbits fed at the rate of 3.2 g. of BHT per Kg. of body weight, the glucuronic acid content of the urine increased from about 55 mg. per 24 hours to an average of 342 mg. per 24 hours[53]. Reduction in the sulphates has also been observed in rabbits fed with BHT. These results indicate that BHT is detoxicated by conjugation with glucuronic and sulphonic acids[53]. Toxicological data of some of the commonly used antioxidants are summarized in Table V.

TABLE V. *Toxicological data of some antioxidants*

ANTIOXIDANT	TOXICOLOGICAL DATA
Propyl gallate[54-56] ...	LD_{50} for mice—2000 to 3500 mg. per kg., for rats—3600 to 3800 mg. per kg. Chronic toxicity dosages 1.17% of the diet. Growth rate is 60% of the control group;[55] at 1% level growth rate in male and female rats is 90% of control group.[56]
Propyl, octyl and dodecyl gallate[51] ...	LD_{50} for rats—5000 to 7000 mg. per kg. and 2000 to 6000 mg. per kg. for pigs. Chronic toxicity—no growth depression at 0.035%, 0.2% and 0.5% level in rats. At 0.5% level of dodecyl gallate, inhibition of growth may occur in the second generation due to diminished food intake.[57]
Nordihydroguaiaretic acid[56]	LD_{50} for mice 2000—4000 mg. per kg., for rats 2000—5000 mg. per kg. and for guinea pigs 830 mg. per kg. Chronic toxicity at 0.5% level in males and 1.0% level in female; growth rate is 80% of control animals.
Butylated hydroxy anisole[56, 58]	LD_{50} for rats and mice.[56] (i) oral—2000 mg. per kg. (ii) in corn oil by stomach tube to non-fasted rats—4130 mg. per kg. (iii) as water emulsion by stomach tube to fasted rats—5000 mg. per kg. Chronic toxicity test at 0.06% level in the diet, no difference was observed in growth rate for 12 weeks. Number, size and mortality of litters comparable and at 22 months no pathological differences were observed in any of the body tissues.
Butylated hydroxy toluene[53]	LD_{50} (fed as 20% solution in corn oil) Male rats—1700 mg. per kg. Female rats—1900 mg. per kg. Cats—940—2100 mg. per kg. Rabbit 2100—3200 mg. per kg. Guinea pigs—10700 mg. per kg. *Subacute toxicity test:* Dogs fed with 1.4 to 4.7 g. of BHT per kg. for 28 days—no sign of intoxication other than moderate diarrhoea. Loss in weight in rats fed with 1-5% BHT ascribed to the low food intake. *Chronic toxicity test:* (i) In dogs fed with 0.17 to 0.97 g. of BHT per kg. per day for 260 days representing a total intake of 45-244 g. per kg. of body weight or 483-2402 g. per dog—dogs were normal. (ii) In rats fed for 2 years with diet containing 0—1.0% of BHT in 1% lard and also 0.5% in 1% lard heated to 150°C for 30 minutes—Gain in weight normal upto 0.8%. At 1.0% level, tendency for the weight of brain and liver to increase in relation to body weight was observed.

In a review on this topic, Ward[59] suggests that excepting NDGA, about which much study has not been reported, BHA, BHT and gallates are of sufficiently low toxicity and can safely be used in foods.

C. COLOURING AGENTS

The use of coal-tar dyes in foods has presented various problems. β-naphthylamine which forms an intermediary in the synthesis of some of the azo dyes has been found to cause bladder cancer in the workers of the factory. The first symptom occurred after a lapse of nearly 20 to 30 years from the time of their first exposure to carcinogen and the actual development of the recognizable disease, that too in workers who had been working with a completely new type of substance[60]. Actual experimental evidence came after it had been established by statistical and clinical research. A few decades later, it was observed that Butter Yellow (an azo dye *para*-dimethylaminoazobenzene) produces liver tumor in rats. Ducker and Hamper[60] have shown that carcinogenic effect of Butter Yellow is revealed after long periods. Rats developed tumors when a total dose of 1000 mg. was administered over a period ranging from 34 days to 1 year. Small dosages can cause adverse effect on health.

1. Biological Properties of Sulphonic Acids

As has been mentioned earlier, of the 13 colours permitted under F.P.O., 8 are sulphonated azo compounds. Sulphonic acids are strong acids which are completely ionised at physiological pH values. The $-SO_3H$ group is one which is not modified in the body and is biologically stable. It is not readily absorbed from the intestine unless the compound is fat-soluble, which is unusual, and hence rapidly excreted from the body[31].

Some of the sulphonated dyes (Brilliant Blue FCF, Guinea Green B, Light Green SF and Fast Green FCF although not readily absorbed from the intestine, have been suspected to produce tumors in rats, particularly on injection[31] and hence not included under permitted list. Reference has been made that the water-soluble dyes are not carcinogenic. Conversion of fat-soluble dye into a water-soluble one, can be achieved by sulphonation. Not all the water-soluble dyes are, however, non-carcinogenic.

The water-soluble sulphonated orange I used in confectionery has the cathartic action and produces diarrhoea in man in doses of 80 mg.[32]. Other azo dyes, which are oil-soluble, have been found to behave similarly (Table VI)[63].

TABLE VI. *Dyes with cathartic action*

Dye	F.D. & C.	Classification	Remarks
Oil yellow AB	Yellow No. 3	C	Produces tumor in mice at 2.5% of diet.
Oil yellow OB	Yellow No. 4	C	,,
Oil orange TX	Orange No. 2	C	,,
Oil orange XX	Red No. 32	C	,,

Azo dyes to be considered safe for use in food should be sulphonated on aromatic groups on both sides of the azo link. Azo dyes falling under A category are accordingly sulphonated[31]. Multiplicity of sulphonic acid groups, however, is not always a complete safeguard against carcinogenicity. Light Green SF which has three such groups causes sarcoma in rats[64].

2. Biochemical Properties of the Azo Group

Some of the azo dyes with an amino grouping in para position relative to the -N=N-grouping possess carcinogenic tendency to a marked degree. Alteration in chemical structure as for e.g. substitution of $-NH_2$ group by OH group, shift of $-NH_2$ group to meta or ortho position or the introduction of $-SO_3H$ group so as to make the dye water-soluble may result in a marked decrease or complete suppression of carcinogenic properties.

The azo group of the dye may be split in the body by the action of the enzyme present in the liver which may result in the

formation of a carcinogenic amine (β-naphthylamine or its carcinogenic metabolite, 2-amino-1-naphthol)[31]. Such a breakdown may occur with 2-naphthylazo dyes which are not sulphonated. These dyes are not permitted under F.P.O. Sulphonated 2-naphthylazo dyes which include Red 6 B and Red FB are, however, permitted. Carcinogenic amines are believed to exert their effect, through being converted *in vivo* into *o*-hydroxyamines, which are the actual carcinogenic agents[65,66]. Both 1-amino-2-naphthol and 2-amino-1-naphthol are carcinogens, but 3-amino-2-naphthol and 2-amino phenol are not[67]. Sulphonation of Sudan Yellow (1-phenylazo-2-naphthol) once used as food colour and which produces Heinz bodies (granules which appear in the erythrocytes) when sulphonated, can produce Orange G (1-p-phenylazo-2-naphthol-6:8-disulphonic acid), Orange II (1-p-sulphophenylazo-2-naphthol-6 : 8-disulphonic acid) and Yellow FCS (1-sulphophenylazo-2-naphthol-6-sulphonic acid) colours. Both Orange G and Orange II produce Heinz bodies in rats but Yellow FCS does not[68]. Of these dyes, only yellow FCS is sulphonated on both sides of the azo link and when it splits *in vivo*, amine sulphonic acids are formed which apparently do not produce Heinz bodies[69]. Sunset yellow FCF and Amaranth which are both sulphonated 1-naphthylazo dyes are apparently non-carcinogenic, since biological reduction of them would yield 1-naphthylamine which is unlikely to produce 1-amino-2-naphthol but possibly 4-amino-1-naphthol[70]. These dyes probably split *in vivo* to non-toxic amine sulphonic acids. F.P.O. list contains four class A, 1-naphthylazo dyes namely Ponceau 4 R, Carmoisine, Amaranth, and Sunset yellow FCF.

3. Problems in the Investigation of Coal-Tar Dyes for Carcinogenisis

Coal-tar dyes have presented certain problems. (*i*) The chemical formula does not provide a means to decide whether a particular dye is liable to cause late symptoms owing to chronic degenerative changes or worse still the tumors[60], (*ii*) There is a long delay from the time of exposure to the actual development of cancer in man. Hence exposure to an unsuspected carcinogen may be prolonged and extensive before the danger becomes evident[71], (*iii*) There is no relationship between toxicity and carcinogenicity. As a rule the toxic dose of carcinogen is higher than carcinogenic dose[72], (*iv*) Different species of animals differ considerably in their response to any one substance. What may be a potent carcinogen to one animal might be apparently harmless to another[60]. Chemical compounds outstandingly carcinogenic in rodents are usually ineffective in other species[73]. β-naphthylamine is carcinogenic to man and dogs but much less so for rabbits. 3,4-benzopyrene is extremely carcinogenic to laboratory animals but fails to induce tumor in monkeys and dogs. Majority of the chemicals have not been shown to cause cancer in man, and (*v*) Most of the carcinogens are not soluble in water. Hence, they are not likely to be easily absorbed from the site of subcutaneous injection. Exception to this is the triphenylmethane dye—Light green SF yellowish—a water-soluble dye, which causes sarcoma at the site of injection. The development of sarcoma may be due to its decomposition products[74]. These are some of the main problems which have come in the way of proving beyond doubt whether a particular coal-tar dye is absolutely harmless or not. The only valid evidence at present of cancerousness of coal-tar dyes to man is the carefully analyzed epidemiological data.

Future prospects: In view of these conflicting evidences, the opinion in favour or against the use of coal-tar dyes in food is divided. Since the consumers would like to have products with appetizing colour and as the small quantities used may not

be harmful, colouring matter will continue to be used. What is needed is an effective safeguard against the possible hazards.

D. EMULSIFIERS AND SURFACE-ACTIVE AGENTS

Synthetic chemicals like mono- and di-glycerides, non-polar compounds such as sorbitan monolaurate, polyoxyethylene esters, polyoxyethylene sorbitan esters and similar compounds are now made available for use in foodstuffs under different trade names In addition to the above synthetic compounds, products derived from natural sources such as lecithin, alginates, methyl cellulose, etc., find extensive use in various foods.

Mono- and di-glycerides used as emulsifiers are normal nutrients equivalent to tri-glycerides and give rise to identical products in digestion[75]. More than one half of the fat consumed may appear as mono- and di-glycerides during digestion of the fat in the intestine. The maximum amount that might be intentionally added to foods cannot be expected to exceed approximately 2g. per day assuming that 100g. of fat is consumed per day. The amount intentionally added to foods does not, therefore, significantly alter the level of consumption and has also been found to have no significant effect in altering the interfacial tension in the intestine. These facts have led to the conclusion that mono- and di-glycerides are safe for use in food. Monolauric and sulphoacetate derivatives of mono- and di-glycerides are, however, not permitted.

The advent of surface-active agents, their possible use in food and the consequent toxic hazard have given rise to serious apprehension. The nature and the toxicity of these chemicals in human systems have not been clearly understood. For example, glycerol is harmless but glycol is suspected. Ethylene glycol used as antifreeze and as solvent for sulphonamides resulted in tragic deaths[33]. Propylene glycol monostearate is still advertised for addition to cakes to improve their texture and uniformity and to reduce staling.

A great deal of biochemical and pharmacological studies[76, 78] have been made in recent years on the use of polyoxyethylene derivatives but the result are contradictory. Polyoxyethylene is usually combined with stearic acid. When hydrolysed *in vitro*, glycol and stearic acid is formed. The latter may be absorbed in the system but what happens to glycol is not clear. Moderate doses of glycol showed some increase in oxalic acid, while massive doses caused urinary calculi[33]. In the animal experiments, polyoxyethylene stearates caused the incidence of bladder stones in hamsters and rats[78-80]. Changes in the absorption of fats and cholesterol in human systems have also been reported[33]. Though the potential toxicological hazard in the incorporation of polyoxyethylene stearates into foods in technologically desirable quantities may not be great, nevertheless, narrow margin of safety and the biological behaviour needs consideration in the use of such chemicals in foods.

Sorbitan esters have been observed to be free from toxicity but may contain polyethylene glycols which may cause injury to the consumers. Some of them have been found to be carcinogenic. Tween 60 (Polyoxyethylene sorbitan mono-stearate) which is used as dispersing agent in various foods and as antibloom agent in chocolate has been demonstrated to produce papiloma and carcinoma when applied to the skin of the mice[81] and sarcoma when injected to rats[82]. There is no evidence that it is carcinogenic on feeding[83] but definitely so by two other methods of administration. Myrj proposed as an antistaling agent for bread, has been reported to produce, when fed to rats at a level of 25 per cent in the diet, urinary bladder calculi associated in some cases in the bladder tumors[84].

The surface-active agents may also exert powerful surface-active action in the intestinal canal and may modify absorption as in the case of vitamin A which cannot be utilized when the product contains the emulsifier Tween 40. Certain Spans and Tweens are much more suspected than are the members of the Myrj series. Further, surface-active agents are not pure substances and may contain appreciable amounts of glycols which are objectionable. These agents were originally intended for use in textiles, pharmaceuticals, and cosmetics and may find place in food[34].

Considering the need for the use of emulsifiers and surface-active agents in food and the toxic hazards associated with their use, the food standards committee in U.K. has characterized this group of additives into three groups. The particulars are given in Table VII[85].

The subject matter of the toxicological problems arising from the use of surface-active agents in foods have been discussed in detail by Cox[33] and Aylward[85].

E. SWEETENING AGENTS

Saccharin, an amide of *o*-sulphobenzoic acid, is considered as a safe food additive. Succaryl (sodium cyclohexyl sulphamate) which is 100 times as sweet as cane sugar has been found to be quite safe. Chronic toxicity studies with dulcin indicated that at 0.1 per cent level, it produced liver cancer in rats. At 0.5 to 1.0 per cent, most of the test animals died before completion of two years. Margin of safety in the case of P-400 is very narrow and further it has a powerful local anaesthetic action.

F. FLAVOUR

The flavouring compounds used in food can be divided into eight classes—(*i*) esters of aliphatic and aromatic alcohols with fatty acids, (*ii*) alcohols, (*iii*) aldehydes, (*iv*) phenols, (*v*) phenolic ethers, (*vi*) ketones, (*vii*) lactones, and (*viii*) aliphatic acids. Most of the flavouring agents are innocuous substances, especially in view of the minute quantities in which they are used[31,86].

G. FLOUR AND BREAD IMPROVERS AND FLOUR BLEACHERS[34]

The desirable baking quality of the bread develops only after certain ageing. Until 50 years ago, ageing was the only method. Later, it was discovered that ammonium

TABLE VII. *Some esters having surface-active properties used or proposed for use in food*

Derived from— (Alcohol)	Category A	Category B		Category C
	Appear to be harmless—considered safe for use at present	i No health hazard suspected but further biological data desirable. Considered safe for use at present	ii Biological data inadequate or conflicting, to be excluded until further data is available	Substances known or suspected to be definitely harmful
Mono- ...	Stearyl-tartarate		Lauryl sulphate Dioctyl derivatives	
Di- ...		Propylene glycol stearate or alginate	Polyoxyethylene derivatives	
Tri- ...	Glycerylmono—and diesters		Polyglycerol derivatives	
Penta- ...	Lecithins		Pentaerythritol esters	
Hexa- ...		Sorbitan esters		

persulphate or potassium bromate added to flour would bring about similar changes. Since 1919 to 1946, nitrogen trichloride was extensively used under the trade name 'Agene' and by 1946, about 85 per cent of flour in western countries was 'Agenized'. In 1946, Sir Edward Mallanby showed that agenized flour caused 'running fits' (or canine hysteria) in dogs. The disease was also demonstrated in rats which were more sensitive. The toxic substance in agenized flour was found to be methionine sulphoxime which possibly acted as a physiological antagonist of methionine. The method has been discontinued since then, even though there was no positive evidence that it would cause similar effects in human beings in spite of its extensive use. Flour maturing and bleaching agents now, generally in use, have already been given. These are considered safe for use in food.

VI. TOXICOLOGICAL EVALUATION OF SAFETY OF CHEMICAL ADDITIVES[87,88]

The toxicological problems arising from the use of intentional additives were discussed in the foregoing paragraphs. In order to safeguard the public health against the hazards that might arise from the use of chemical additives in food, a number of tests have been devised. Acute toxicity test is desired to give the inherent toxicity of the material. The dosage of a drug or additive is usually expressed in terms of weight per kilogram of body weight. The dose required to cause death in 50 per cent of the test animals is termed as 'Lethal Dose' and is written as 'LD_{50}'. Long-term toxicity tests for chronic toxicity are usually designed to ascertain the dose that may be absorbed over long periods ($\frac{1}{2}$ to 2 years) without producing signs of toxicity when given in large amounts and to exclude the possibility of toxic amounts producing some hitherto unsuspected reaction in the experimental animals. Lehman and his co-workers[80] have outlined the toxicological studies which they consider necessary when a material is to be added to food. The most important investigations suggested are outlined in Table VIII.

TABLE VIII. *Techniques and procedures suggested in toxicological studies*[87, 89]

A. Chemistry
- (i) Solubility.
- (ii) Chemical characterization.
- (iii) Quantitative detection in micro amounts.

B. Acute toxicity and pharmacodynamics.
- (i) Oral LD_{50} in several species.
- (ii) Pharmacodynamics.

C. Allergic response.
- (i) Sensitizing reaction in guinea pigs.

D. Sub-acute and chronic toxicity.
- i) Sub-acute—2 to 4 months feeding in rats and dogs.
- (ii) Chronic toxicity—long-term toxicity in rats and dogs.
- (iii) Reproduction studies.
- (iv) Paired feeding.

E. Biochemical studies.
- (i) Absorption, distribution and excretion.
- (ii) Detoxication mechanism and fate.
- (iii) Organ function tests.
- (iv) Studies on enzymes.

F. Pathology
- (i) Gross examination of organs and tissues.
- (ii) Detailed histological examination of organs and tissues of control and experimental animals.

Sub-acute toxicity test is designed as a pilot experiment to guide the planning of chronic toxicity test from which it differs only in magnitude and duration. This test in itself is a formidable undertaking and indeed few substances receive any further study[87]. The study helps to establish the toxic level, the nature of toxic response and the tissues affected. The data also permits selection of suitable dosage level for long-term chronic toxicity studies. From the

sub-acute toxicity test, if the chemical is found satisfactory for use in food, long-term chronic toxicity study is carried out.

In the interpretation of the data from animal feeding experiments to human beings, an adequate margin should be allowed between the highest dosage tested for toxicity and the upper limits of dosage allowed in foods. The values for these doses may vary greatly from substance to substance and from species to species. Frazer[90] has pointed out that there is a certain degree of consistency in the ratio of ineffective, effective, toxic and lethal dosage for a large number of drugs in man. The ratio is frequently of the order of 1:10:100:1000.

As a rule, if a substance causes no demonstrable effect when fed to animals in long term tests at a dosage level of 1 g. per Kg. of body weight then it is considered as non-toxic. Acceptable dietary intakes are estimated on the basis of the 'standard dietary dose' calculated from parts of the substance likely to be ingested per thousand parts of total diet. Frazer[91] has presented an approximate relationship between various dosage standards as shown in Table IX. He suggested that an acceptable dosage level of a chemical to be used in food should be one tenth of the inactive dosage level calculated as mg. per Kg. of body weight.

For general guidance, a standard dietary dose for a man weighing 150 lb. (expressed in parts per 1000 parts of the total diet) based on the proposed concentration for use in food should be agreed upon. If the test indicates no toxicity in a dose which is 100 times the standard dietary dose, this may be regarded as a reasonable margin of safety, covering any difference in quantities used or consumed. He further points out that any additive, whose concentration exceeds more than 10 parts per 1000 parts of the diet, can be permitted for use in food. Hedge and Steiner[92] have published a tabulation of toxicity classes which is shown in Table X.

TABLE IX. *Suggested dose relationships for interpretation of toxicity tests*

Dosage group	Results	Quantitative data required	Approximate acceptable dose relationship
Lethal ...	Death	LD_{50}	10,000
Toxic ...	Demonstrable tissue damage	ED_{50}	1,000
Effective ...	Significant modification of tissue structure or function	ED_{50}	100
Ineffective ...	No significant change in structure or function	No significant difference as compared with controls	10 } Common range for food additives
Acceptable dietary level ...	...		1 } Common range for food additives

TABLE X. *Toxicity classes with probable lethal dose*

Toxicity rating	Category	Single oral dose per Kg.	Probable lethal dose per man
1.	Extremely toxic ...	1 mg. or less	A taste—1 grain
2.	Highly toxic ...	1-50 mg.	1 teaspoon (4 ml)
3.	Moderately toxic ...	50-500 mg.	1 oz.
4.	Slightly toxic ...	0.5-5.0 g.	1 pint
5.	Practically non-toxic ...	5.0-15.0 g.	1 quart
6.	Relatively harmless ...	15.0 g. or more	1 quart or more

When the catabolism of proposed additive can be fitted into already well recognized and well established patterns of biological reactions as in glycerides, propionates, sorbates etc., then less information may be required for proving in an unequivocal manner, the harmlessness of the product. Maynard[93] points out that if the long-term studies demonstrate a low order of toxicity and if a new compound in the same series is shown to be of same toxicity from acute and short-term studies and further, if it can be demonstrated that the material is absorbed from the gastro-intestinal tract, it would seem unnecessary to conduct long-term studies.

VII. PHILOSOPHY OF THE USE OF CHEMICAL ADDITIVES IN FOOD

The ever growing impact of chemical industry on the technology of food production has resulted in the accidental or deliberate addition of new chemicals to a variety of foods. Many additives such as preservatives, antioxidants, flavouring compounds, colour, etc., which have been developed, have been useful in extending the shelf-life of the product or in enhancing the palatability, convenience and attractiveness. Science is inspired by good intentions but the possibility of toxic hazards arising from their use have given rise to serious apprehensions with regard to the consumption of such foods.

The health, life span, fertility and susceptibility to various diseases of human beings are determined by the complexity of the environments in which they live and there is no justification to add further to these complexities. During the last fifty years, particularly in western countries, there has been decrease in home preparation of food and increase in the use of prepared foods. In large scale manufacture of prepared foods, chemical additives are used to ensure uniform quality of food to the consumer. Use of chemical additives in food, therefore, is dictated by circumstances[87]. On the other hand, as pointed out by Frazer[87], there are those back-to-nature enthusiasts who think that people in 'good old days' were healthy because they used to take only natural unprocessed foods. It is generally felt that substances of natural origin are inherently safer to eat than synthetic chemicals. Some of the natural constituents of the diet may lead in some cases to diseases and perhaps to more rapid ageing and earlier death as for example, cholesterol containing foods may have an influence on the arterial degeneration, rancid fats may cause severe gastro-intestinal disturbance and the wheat flour, whether agenized or not, may cause marked aggravation in the condition of children with the so called 'coeliac syndrome'[87]. In these cases, natural food materials consumed for centuries have been shown to give rise to some deterioration in health. Potent organic poisons are of natural origin and severe outbreaks of food poisoning, other than those due to inorganic compounds, have had a natural origin. There is no evidence to show that the health of any human being has ever suffered in any way from the consumption of any of the chemical additives in common use. On the contrary, public health stands higher today than in the early days.

Intentional food additives are essentially non-toxic substances used to maintain or increase the desirable properties in food. Such findings that some of the azo dyes may be carcinogenic and the agenized flour may cause running fits in dogs gave rise to serious apprehensions with regard to the use of chemical additives in food. Mallanby confirmed his findings of agenized flour causing running fits in dogs by animal experiments in dogs and ferrets. A simple lesson to be learnt from his experiments is

that the suitability of well planned animal investigations using standard laboratory animals cannot be questioned for this type of work. Agenized flour, however, has no detectable effect on man[94,95] and the same may apply to all the common foods with additives. The direct or indirect effect of any food additive on biological systems may be adequately assessed by toxicological studies as already outlined and their harmlessness insured by animal experiments as well as by final tests on human subjects. When the results are satisfactory, there should then be no objection to their use in food[87].

In view of the fact that toxicological data regarding the safety of the chemical additive for use in food is required to be furnished to the regulatory agency before being permitted for use in food, the risk for life and health owing to their presence in consumer foods is remote. There is absolutely no need for alarm about the present use of chemicals. What is needed is the provision of adequate safeguards for the health of the public.

VIII. STANDARDS FOR CHEMICAL ADDITIVES

Standards are established as a rule by authority of the Government. Standards encourage uniformity and quality of the product and assure supply of wholesome food. Brief history of the development of standards has already been mentioned earlier. The Food Additive Amendment legislation passed in 1958 in U.S.A. lists direct and indirect additives permissible in food. Many extensions to the original list have been made since then. The Food and Drug Act of Canada passed in 1953 consolidates the earlier legislation and in addition to other provisions, includes standards for various chemical additives[96]. Various amendments to the original act have been issued since then. Regulations in U.K. regarding additives are in the form of permitted lists and include colourings, preservatives, antioxidants, emulsifiers and stabilizers[97]. France, Germany, Switzerland, Netherland, Australia etc. have well established standards[10]. In the Far Eastern countries, there is general awareness of the hazards of the pesticide residues[98] and some of the countries have laid down detailed specifications for pesticides and formulations and have prescribed the limits. Standards for food additives in India are included under Fruit Products Order of the Ministry of Food and Agriculture, Government of India, with regard to fruit and vegetable products and under the Prevention of Food Adulteration Act for other products.

While different countries have been endeavouring to lay down National Standards, never before in the history has there been so much effort made at international level as at present, for International Food Standards and related problems[99]. In 1962, the Food and Agriculture Organization of the United Nations listed 135 organisations other than Government Organizations as working for International Food Standards, which include standards governing additives, pesticide residues, sanitation, standards of identity, quality etc[99].

International standards help to provide essential safeguards for protecting consumer health and to insure fair food trade practices. The need to simplify and harmonize international food standards on a broad base became apparent through a growing demand for corrective action. This action came through the leadership of the Food and Agriculture Organization and the World Health Organization in establishing a joint programme on food standards. This programme is being conducted by the Codex Alimentarius Commission. The basic purpose of this Commission is to simplify and harmonize international food standards by allocating

priorities in the development of standards, co-ordinating and supplementing the work of other bodies in the food standards field, providing for final draft standards at the government level and publishing them in a consolidated Codex Alimentarius[90]. The Commission has allocated preparatory work on draft standards largely in accordance with the priorities established at the 1962 Joint FAO/WHO Geneva Conference. An Expert Committee on Food Additives is developing draft lists of acceptable additives and surveying and designing various possible proposed maximum levels of use for these additives in individual foods.

IX. FUTURE CONSIDERATIONS

The efforts of national and international organizations with regard to the use of food additives will overcome the apprehensions that may still be remaining. The food available to man today is in short supply. With increasing population concentration in larger urban areas, the problem of providing them with an adequate food supply around the year becomes immensely complicated. The foods eaten constitute more and more of preserved foods in one form or another and lesser of fresh commodities. Since the process of preservation inflicts changes in natural characteristics, in order to preserve the foods which would very nearly equal fresh commodities in nutritional values and organoleptic qualities, chemical additives are invariably essential. Further exploration of chemical additives in this regard appears desirable and is in public interest.

Legislation which protects the public health is absolutely necessary as past history has clearly revealed. Such laws should, however, at the same time not stifle the development of materials which are needed and which would have legitimate uses. Legislation may have such an effect, if it is not drawn with utmost skill and expert guidance from a multitude of disciplines. Biochemists, pharmacologists, food scientists and technologists have important roles to play in such activities.

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Book Review

Tomato Paste, Puree, Juice and Powder by PETER G. GOOSE AND RAYMOND BINSTED, Food Trade Press Ltd., 7 Garrick Street, London, W.C. 2, 1964, pp. x+151, Price £2 10s.

Next to grapes, bananas and oranges, tomato is the fourth most important fruit in terms of world production which was 16 million tons in 1961. Rapid development of tomato processing industry in Europe and U.S.A. has, no doubt, been due to considerable amount of research and development work in the production of suitable raw material and introduction of advanced processing techniques. In the past decade, there has been a phenomenal output of scientific and technical papers on all aspects of tomato processing. In the present book, while the authors have not attempted to review all the published reports, they have aimed to provide an up-to-date guide to the production of tomato products making the book particularly useful to those who work in the industry or are connected with quality control and factory management.

Chapter one describes in detail the definition, characteristics and quality of tomato paste; chapter two lists quality factors like yield, composition and overall quality for paste production of about twenty varieties; chapter three outlines the methods of manufacture of tomato paste, receipt of tomatoes at the factory, washing, soaking and trimming, crushing and pulping, concentration, filling into cans and sealing, cooling and packing; chapter four describes the equipment like flumes, washing units, sorting tables, crushers, preheaters, juice extractors, refiners, evaporators and coolers used in the production of tomato paste; chapter five gives practical details for cleaning plant and equipment; chapter six describes in detail the quality evaluation factors like total solids, insoluble solids, acidity, sugar, salt, copper, ascorbic acid, consistency, texture, colour, mould count, fly egg count, and insect fragment count; chapter seven lists important practical points while inspecting tomato paste factories and chapter eight discusses other important allied tomato products like tomato juice and tomato powder.

Throughout the volume, copious use is made of illustrative pictures of machinery and equipment. Outline of complete, continuous line for the production of tomato paste in an Italian plant in Parma is highly instructive and useful. Judicious use is made of tables and diagrams. Juice and concentration tables at the end of the book are particularly useful to the production manager. Bibliography, references and index add to the value of the book.

B. S. BHATIA

NOTES and NEWS

- *Rs 8.75 Crore outlay for Farm Varsity's Fourth Plan*
- *Potato Ground*
- *U.P. Fruit Products Manufacturers' Association*
- *Castor Processing Plants for Hoshiarpur*

Rs 8.75 Crore outlay for Farm Varsity's Fourth Plan

The final blueprint of the Punjab Agricultural University for the Fourth Plan reveals that the University will spend Rs 125 lakhs for the expansion of research, teaching and educational facilities in the hilly areas of the State. The entire Fourth Plan of the University will cost Rs 8.75 crores.

In order to tackle the special agro-climatic problems of the hilly regions of Punjab, the University proposes to set up a Junior College of Agriculture at Palampur at a cost of Rs 20 lakhs. Besides, a sum of Rs 40 lakhs will be spent on the establishment of a College of Animal Science at Hissar in order to devote adequate attention to this branch of knowledge.

The University proposes to set up Vocational Agricultural Schools for the sons of farmers at a cost of Rs 125 lakhs. Out of this, Rs 83.59 lakhs will be spent in the plains and Rs 41.41 lakhs in the hilly areas.

The Plan also envisages an expenditure of Rs 164.10 lakhs on research schemes including the setting up of Soil Testing Laboratories at a cost of Rs 8.10 lakhs in the plains and Rs 1.90 lakhs in the hilly areas. It is also proposed to establish a Regional Salinity Laboratory at a cost of Rs 8 lakhs and an Animal Disease Research Laboratory at Palampur at a cost of Rs 7 lakhs.

Potato Ground

Potato growers in Jullundur district—the biggest potato-growing district in the State—are rapidly taking to mechanized methods of potato-growing. The entire operation of 'ridging', sowing and weeding is done by newly introduced machines.

U.P. Fruit Products Manufacturers' Association

The Annual General Meeting of the U.P. Fruit Products Manufacturers' Association was held at Dar-ul-shafa (Legislative Home, Lucknow) under the presidentship of Shri K. P. Bhargava. The Meeting was inaugurated by Shri Darbari Lal Sharma, Chairman, Legislative Council, U.P.

In his inaugural address, Shri Darbari Lal Sharma appreciated the efforts of food processors in developing the industry. He stated that the industry has to play a vital role in times to come with the changing food habits of people. In view of the shortage of tinplate, he stressed the need for dehydration of fruits and vegetables by the industry.

Resolutions on the following subjects were passed unanimously:

(*i*) Protesting the decision of the India and Pakistan Conference to raise ocean freight rates on cargoes to West Bound countries by 7½ per cent from August 1966 on the basis that it will adversely affect the export trade.

(*ii*) Tax Credit facilities should be made applicable on exports of fruit products.

(*iii*) Release of adequate quantity of tinplate for supply of containers to the industry.

The following office bearers were elected:

1. *President:* Shri K. P. Bhargava, G.G. Industries, Agra.

2. *Vice-President:* Shri N. A. Pandit, Kissan Products Ltd., Bareilly.
3. *Secretary:* Shri B. N. Tandon, U.P. Chemicals & Fruit Products Pvt. Limited, Bareilly.
4. *Joint Secretary:* Shri M. L. Aroura, Aroura Fruit Industries, Lucknow.

Members of the Executive Committee

1. Shri S. G. Bam, Spencer & Company Limited
2. Shri Bimal Gupta, Bimal Fruit Products
3. Shri P. B. Mathur, G.G. Industries, Agra
4. Shri Narendra Prashad, Shri Gyan Chand Murabbawala
5. Shri S. R. Tandon, S. R. Cannery
6. Representative of M/s Dyer Meakin Breweries Ltd.
7. Shri Dharam Dutt Vaidya, M.L.A.

The Patron of the Association proposed vote of thanks.

Castor Processing Plants for Hoshiarpur

The farmers of Hoshiarpur District would soon be producing and processing castor oil and its numerous by-products when the plan for a network of Co-operative Castor Marketing-cum-Processing Societies is implemented. The State Co-operative Dept. is understood to have drafted experts to draw up a comprehensive plan in this regard for Hoshiarpur, Gurdaspur, Hissar, Karnal, Ambala and Gurgaon Districts. The castor crop, which is so far planted for soil conservation purposes, can prove a good foreign exchange earner, if grown as an oil-seed crop.

At present, nearly 27,000 acres of land is believed to be under castor crop in Punjab, of which over 6,000 acres is in Hoshiarpur alone.

F.P.O. News

- *Contracts Placed by the Chief Director of Purchase, Ministry of Food and Agriculture (Government of India), New Delhi*
- *Agricultural and Food Products Division Council*
- *Indian Standards*
- *Planned Development of Cold Storage Industry*
- *Seminar on Processed Foods Export*

Contracts Placed by the Chief Director of Purchase, Ministry of Food and Agriculture (Government of India), New Delhi.

The following statement contains particulars of contracts placed by the Chief Director of Purchase, Ministry of Food and Agriculture, Department of Food (Army Purchase Organisation), Government of India, New Delhi, during the weeks 4th December to 25th December, 1965 (Orders of less than Rs 2,000 in value are not included).

Sl. No.	Tender No. and Article	Qty. in tonnes	Amount Rs	Name of the contractors	Imported or Indigenous	F.O.R. Delivery at
1	5/2/42/65-Pur-VI dt. 17-11-65 French Flat Beans	2–500	5,475	M/s. Darlco Cannings Ltd., Trichur	Indigenous	Trichur
2	5/1/6/66-Pur-VI dt. 3-11-65 Pineapple Tinned	25–000	91,000	M/s. Cannig Industries Cochin Ltd., Trichur	,,	,,
3	5/1/7/66-Pur-VI dt. 6-11-65 Pineapple Tinned	30–000	10,700			
4	5/2/42/66-Pur-VI dt. 17-11-65 French Flat Beans	2–500	5,475			
5	5/2/42/65-Pur-VI dt. 22-11-65 Kundri in Brine	10–000	15,900	M/s. R. N. Rustomji & Co., Bombay	,,	Wadibunder
6	5/1/6/66-Pur-VI dt. 5-11-65 Papaya Tinned	20–000	61,000	M/s. Dr Writer's Chocolates and Canning Co., Bombay	,,	,,
7	5/2/42/65-Pur-VI dt. 22-11-65 Tomato Canned	10–000	28,600	M/s. The New Swadeshi Sugar Mills Ltd., Allahabad	,,	,,
8	5/2/42/65-Pur-VI dt. 22-11-65 Baked Beans in T/Sauce	12–000	27,960			
9	5/2/42/65-Pur-VI dt. 22-11-65 Peas in Brine	44–000	1,05,160			
10	5/2/42/65-Pur-VI dt. 22-11-65 Carrots in Brine	8–000	13,360			
11	5/1/6/66-Pur-VI dt. 6-11-65 Pineapple Tinned	20–000	63,000	M/s. Tims Products Ltd., Parganas	,,	Belgharia
12	5/1/7/66-Pur-VI dt. 10-10-65 Pineapple Tinned	20–000	69,400	M/s. Tims Products Ltd., Parganas	,,	,,
13	5/2/42/65-Pur-VI dt. 22-11-65 Carrots in Brine	8–000	13,360	M/s. Tims Products Ltd., Parganas	,,	,,
14	5/2/42/65-Pur-VI dt. 22-11-65 Peas in Brine	44–000	1,05,160			
15	5/2/42/65-Pur-VI dt. 22-11-65 Baked Beans in T/Sauce	8–000	18,640			
16	5/1/6/66-Pur-VI dt. 8-11-65 Orange Tinned	20–000	70,000	M/s. Midland Fruit and Vegetable Products (I), New Delhi	,,	Mathura
17	5/2/42/65-Pur-VI dt. 22-11-65 Carrots in Brine	9–000	15,030			
18	5/2/42/65-Pur-VI dt. 22-11-65 Peas in Brine	43–000	1,02,770			
19	5/2/42/65-Pur-VI dt. 22-11-65 Baked Beans in T/Sauce	20–000	46,600			
20	5/2/42/65-Pur-VI dt. 22-11-65 Tomatoes Canned	40–000	1,14,000			

Agricultural and Food Products Division Council

The eleventh meeting of the Agricultural and Food Products Division Council was held on 25 March 1966 at Manak Bhavan under the Chairmanship of Dr M. S. Randhawa, Special Secretary to the Government of India, Ministry of Food, Agriculture, Community Development and Co-operation. The Council reviewed the work done by the Agricultural and Food Products Division of the Indian Standards Institution and noted that 64 standards had been published on various agricultural and food products during the year 1965 and expressed its satisfaction on the same. It also approved several additional subjects in the field of animal feeds, farm implements, spices and condiments, seeds, fruits and vegetables, etc., for the formulation of Indian Standards. The subject of the formulation of Indian Standards for alcoholic drinks was reconsidered and it was decided to continue the work already initiated.

Indian Standards

Indian Standards Institution has prepared a draft Indian Standard Specification for Packaging Apples (Doc: AFDC 23 [430]). The proper packaging of fruits plays a very important role as it prevents spoilage of these perishables during handling and transport over long distances. Moreover, the standardized packages facilitate mechanised production and easy handling and palletization, stacking, loading and unloading for the carriers. This draft Indian Standard helps to achieve these objectives, as it prescribes the materials required for the construction of these packages, the method of construction and the different sizes of the packages.

Indian Standards Institution has published Indian Standard Specifications for the following:

(*i*) Canned Bitter Gourd (Karela) (IS: 3247-1965) which prescribes the requirements for bitter gourd canned in brine. The Standard is priced at Rs 3.50.

(*ii*) Fodder Yeast (IS: 3193-1965) which prescribes the requirements and the methods of test for fodder yeast as livestock and poultry feed. Fodder yeast is used for supplementing animal feeds with protein and vitamins of B Complex group. It is manufactured from surplus, cheap or waste carbohydrate or sugar sources, such as sugar cane juice, molasses, fruit juice, citrus waste, protein waste liquors and mashed grains and also from hydrolysed wood and sulphite liquor from the paper industry by growing organisms, such as *Saccharomyces*, *Torula* and *Candida* yeasts. The yeast thus obtained is separated, washed and suitably dried to kill the cells and obtain inactive fodder yeast. The Standard is priced at Rs 5.00 per copy.

Copies of the standards are available from the offices of the Indian Standards Institution at New Delhi, Bombay, Calcutta, Kanpur and Madras.

Planned Development of Cold Storage Industry

The Government of India has constituted a Central Cold Storage Advisory Committee to advise the Union Ministry of Food on matters pertaining to the enforcement of the Cold Storage Order, 1964 and planned development of cold storage industry in the country. The Committee is headed by the Joint Secretary (Incharge of Subsidiary Food Organisation), Department of Food. Other members of the Committee are the Agricultural Director, Food and Nutrition Board; Director of the Central Food

Technological Research Institute; Fisheries Development Adviser; Dairy Development Adviser; Managing Director, Central Warehousing Corporation and representatives of the Indian Council of Agricultural Research and of the trade.

Seminar on Processed Foods Export

The Seminar on 'Processed Foods Export' held in Bangalore under the joint auspices of the Processed Foods Export Promotion Council and the Indian Institute of Foreign Trade, New Delhi, from December 9 to 13, 1965, appointed a High-level Committee for Fruit and Vegetable Preservation Industry to establish direct link between growers and canners with the active help and assistance of the State Horticulture and Agriculture Departments, under the Chairmanship of Shri K. U. Patel, Vice-President, Processed Foods Export Promotion Council. The Committee had its first meeting at Nagpur on 22nd March, 1966, under the convenership of Shri R. T. Mirchandani, Agricultural Marketing Adviser to the Government. Tentative decisions were taken by the Committee on the targets of production of various items of fruit and vegetable products during the Fourth Plan. The export target of 10,000 tonnes of fruit and vegetable products at the end of the Fourth Plan period was tentatively decided. The Committee will have its second meeting soon where specific requirement of fruits and vegetables to achieve the target is to be discussed.

Export News

- *Uttar Pradesh Export Promotion Corporation*
- *Parties interested in importing fruit and vegetable products from India*
- *Ocean Freight*
- *Export of Chillies from India*
- *Show-rooms at Important Trade Centres Abroad*
- *Profodcil Bulletin*

Uttar Pradesh Export Promotion Corporation

The following statement was made by Shri Manubhai Shah, Minister of Commerce, in the Lok Sabha on the 25th February, 1966.

The U.P. Export Corporation has been incorporated under the Companies Act, 1956, on the 20th January, 1966, with an authorised capital of Rs 50 lakhs, 51 per cent of which is to be held by the Government of Uttar Pradesh and the rest 49 per cent by private shareholders. The Corporation has been set-up with the following main objects:

(*a*) to serve as a channel for the outflow of goods from Uttar Pradesh's medium and small-scale industries to the export markets;

(*b*) to reorient industries in U.P. in relation to export markets and to establish institutions for promotion of scientific research in respect of such industries;

(*c*) to co-ordinate the activities of exporters with the various Export Promotion Councils and Commodity Boards in respect of import entitlements, drawback, etc., so that lack of knowledge or lack of availability of these facilities does not come in the way of export promotion activity;

(*d*) to promote the sale of products made in U.P. by conducting market surveys and also through opening of offices, warehouses, etc., both in India and abroad;

(*e*) to arrange supply of finance to exporters against confirmed orders and also to start, finance or participate in export based industries and

(*f*) to start common facility centres for various industries where exports can get drawings, designs, tools, etc.

3. The Corporation is expected to play an effective role in India's export drive by creating an export climate in the State of Uttar Pradesh and also by serving as a channel for export of goods from that State.

Parties Interested in Importing Fruit and Vegetable Products from India

The following parties are interested in importing canned fruit and vegetable products from India.

M/s C. & H. Company, 304, Alaskan Way So, Seattle, Washington.

M/s Casa D'Arte, 130, Sansome St., San Francisco, California.

M/s Jacob Hamburger Co. Inc., 5300, N. Channel Ave, Portland (Oregon).

M/s Hudson Trading Co., 326, N. River Road, Milwaukie, Oregon.

M/s Indo-Pak Overseas Food Supply Ltd., 65, Queens Crescent, London, N.W. 5.

M/s F. J. Parsons & Co. (M/c) Ltd., 146-152, Corn Exchange, Manchester-4.

M/s B. K. Trading Company, 69, Shamrock Street, Glasgow, C. 4.

M/s S. Singh & Sons (Gravesend) Ltd., 77, High Street, Gravesend, Kent.

M/s Salimi News Agency, Leeds Road, Nelson (Lanchashire).

M/s Bengali Store, 84, Park Road, Bradford 5, Yorkshire.

Mr R. S. Khanna, 4, Cyprus Court, Cyprus Road, Finchley, London, N. 3.

M/s Biologes GmbH, 581, Witten, Utymannstr.—16 (H. Rockfort).

M/s Kuhlmann, Luckau, Merten GmbH U. Co. Kg. 5870, Hemer-Westig-Lohstr.—28.

M/s Commercial Nieesa, Via Layetana 12, Barcelona-3 (Spain).

M/s Cia Distribundora Nacional, 'GODINA', Casilla i-V, Valparaiso, Chile.

M/s Ruyan Store, P. O. Box No. 306, Bahrein.

M/s Mohamed Ali Zainal Abdulla, Importers & Exporters, Tijjar Road, Bahrein.

M/s Valabdas Muljimal & Bros., Post Box No. 6, Tijjar Road, Bahrein.

M/s Abdulkarem Darwish Tattan, General Merchants & Commercial Agents, Bahrein.

M/s T. Choithram & Sons Ltd., 5, Rawdon Street, P.O. Box 26, Freetown (Sierra-Leone).

M/s W. R. Kohsla and Sons Ltd., P.O. Box 45, Tororo, Uganda.

M/s Association Des Consummateurs de La C.F.S., P.O. Box 508, Djibouti, French Somaliland.

M/s Koffman Food Importers Ltd., 1375, Odlum Drive, Vancouver 6, B.C., Canada.

M/s Establissement Michel Hmouda, Imm. Jesuite, Jeetaoui, Beirut.

Ocean Freight

The Freight Investigation Bureau, Bombay, has informed that the India Pakistan Conferences operating in the trade between India and U.K. Continent, have decided to effect a general increase of 7½ per cent in freight rates in both directions effective from 12th August, on West Bound vessels, and 1st June, 1966, on East Bound vessels.

Export of Chillies from India

Trend in the Export of Chillies from India

Year	Quantity (Tonnes)	Value ('000 Rs)	Unit Value in Rs per Kg.
1960–61	8364	17,583	2.10
1961–62	11499	21,565	1.88
1962–63	4876	9,457	1.94
1963–64	12086	28,003	2.32
1964–65	11890	25,067	2.11
Average	9743	20,335	2.09

Export of Chillies from India

Important importing countries	1960–61	1961–62	1962–63	1963–64	1964–65
	Quantity in tonnes				
Ceylon	8,229	11,325	4,712	11,892	11,759
Bahrein Islands	7	22	28	30	13
Kuwait	18	25	29	55	27
Qatar and Trucial Oman	9	6	22	19	12
Germany, East	...	...	...	30	40
United Kingdom	...	3	28	13	12
Others (including small value transactions) ...	101	118	57	47	27
Total ...	8,364	11,499	4,876	12,086	11,890
	Value in thousand rupees				
Ceylon	17,331	21,334	9,203	27,569	24,790
Bahrein Islands	12	34	44	54	25
Kuwait	36	39	54	126	46
Qatar and Trucial Oman	25	9	27	36	15
Germany, East	...	...	...	80	103
United Kingdom	...	4	38	23	27
Others (including small value transactions) ...	179	145	91	115	61
Total ...	17,583	21,565	9,457	28,003	25,067

Show-rooms at Important Trade Centres Abroad

The Government of India is already maintaining 15 show-rooms/trade centres and 6 show-cases/show-windows abroad (as per list below) for providing visual commercial publicity to various Indian merchandise. The State Trading Corporation of India is maintaining show-rooms at Rotterdam (The Netherlands) and Moscow (USSR) and Handicrafts and Handlooms Export Corporation of India is maintaining a show-room-cum-retail show in New York.

The State Trading Corporation of India is proposing to open a third show-room at Montreal (Canada) this month and the Handicrafts and Handlooms Export Corporation proposes to open a new show-room-cum-retail shop at Paris during this year. Further, Government of India has also decided to participate in the Plaza of Nations World Trade Centre, New York, which will come up in 1968.

As a measure of export promotion, the Ministry also recommends to the Reserve Bank of India release of foreign exchange to businessmen for their travel abroad. All legitimate requests are acceded to the extent practicable. Further relaxation in this regard as well as the opening of new show-rooms could be considered when the foreign exchange position improves.

List of existing Indian Trade Centre/ Show-rooms/Show-windows and Show-cases abroad as on 1-3-66.

Trade Centre: Cairo (Egypt)

Show-rooms: (1) Bangkok (Thailand), (2) Baghdad (Iraq), (3) Bahrein (Persian Gulf), (4) Beirut (Lebanon), (5) Colombo (Ceylon), (6) Djakarta (Indonesia). Proposed to be closed on the 1st April, 1966, as a measure of economy, (7) Jeddah (Saudi Arabia), (8) Karachi (Pakistan). Proposed to be closed down on the 1st April, 1966, as a measure of economy, (9) Kabul (Afganistan), (10) Nairobi (Kenya), (11) Tehran (Iran), (12) Khartoum (Sudan), (13) Lagos (Nigeria) and (14) Manila (Philippines).

Show-windows and Show-cases in the premisses of Indian Missions abroad:

London (U.K.), Canberra (Australia), Madrid (Spain), Vienna (Austria), Sydney (Australia) and Mexico (South America).

Profodcil Bulletin

The Processed Foods Export Promotion Council has brought a quarterly bulletin entitled 'PROFODCIL BULLETIN' with effect from December 1965.

The object of the Bulletin is to keep informed the Exporters of Processed Foods and others interested in export promotion of Indian processed foods with facts, statistics and information on overseas markets. The annual subscription is Rs 4 for non-members and the price for single copy is Re 1. It is distributed to its members free.

Foreign News

U.K.

Design of Automatic Powder Filling Machine

Following rapidly on their entry into the Packaging Machinery field, Allen Transmatic announce details of their completely new and patented design of an Automatic Single Head Powder Filling Machine to operate at speeds up to 60 per minute.

The machine basically comprises a single Transfil volumetric powder filling head mounted integrally over an automatic container handling console. The entire novel conception of the machine is in line with the company's policy to supply a complete new range of modern, interesting and reasonably priced packaging machines.

The machine is capable of accommodating rigid type containers in glass, tin, composite, plastic etc. up to 3.5″ (90 mm.) in diameter or similar area and up to a height of 9″ (230 mm.) for filling with most powdered and granular materials.

In operation, containers are loaded by unscrambler or hand to the infeed side of the conveyor belt. This continuously running conveyor takes the containers to a platform to present them to the filling nozzle. After filling, the container is indexed back to the output side of the conveyor and on to subsequent packaging operations. The system basically being an extremely simple in line conveyor with an automatic filling facility. At the point of fill attachments can be supplied to obviate and remove dusting, and to give a controlled degree of compression.

Detailed attention has been given to many points affecting installation, production, maintenance and ease of operator control. The total floor area of the machine is only 7½ sq. ft. (0.7 m^2). The loading height can be varied within a wide tolerance and is easily adjustable. The filling head is also adjustable for height and it will swivel for emptying the hopper, cleaning and easy access.

Styled on modern new lines, the conveyor section houses the entire mechanism on both sides of a main support plate. This has two covers, one front and rear which on removal of two screws leaves the entire mechanism free for immediate access and rapid service.

This approach has left the entire underside of the machine free for ease of cleaning and wash down—important in the modern factory. There is an adjustable three-leg

support which provides stability on any surface. Full consideration has been given to cleaning down the machine. There are crevices for material to collect on the stain-



The entirely new and novel AUTO-TRANSFIL Model ATF. 1. It will operate at speeds up to 60 per minute and accommodate rigid containers in glass, tin, composite, plastic etc. up to 3.5" (90 mm.) diameter and up to a height of 9" (230 mm.) for most powdered and granular materials.

less steel surface covering or panels. All electrical equipment is totally enclosed.

The design is symmetrical around the filling orifice so that the machine can be supplied for left or right hand loading.

Quick maintenance and changeover are prominent features and any single part of the machine can be removed or replaced in a few minutes. One shot lubrication is fitted to provide simultaneous greasing to all working parts.

Variable speed inputs are available and changeover of container size is a very simple operation.

Machine operators can be sited either at the front or rear of the machine, all the controls being readily accessible on the front of the machine. A spillage tray is also provided.

The basic standard Transfil filling head will accommodate a very wide range of powdered products to a tested accuracy of ± 1 per cent and better in many instances. The machine design lends itself to multiplication of filling heads and tie up with ancillary and complimentary equipment.

Further particulars are available from

Mr R. A. Eede, Allen Transmatic Ltd. 18 Lower Teddington Road, Hampton Wick, KINGSTON-UPON-THAMES, Surrey, England.

Specialised Packaging for Dehydrated Soups and A.F.D. Foods

New food processing techniques, such as freeze-drying, have created packaging requirements which foil combined with other materials in laminates is meeting. For example, producers of dehydrated soups have found that a multi-ply wrapper of foil and paper, combined with certain types of films, meets the product's rigid requirements for material that would maintain oxygen content below 2 per cent of the packages total gas content, even after rough handling and long storage, and provide a complete water vapour barrier.

In Britain, Brand Packaging Limited, Pendleton, Manchester-6, has been closely identified with the development of materials of this nature and within recent months has brought into bulk production a large multistage machine specifically designed for the coating of PVDC in up to five layers to take the place of the films previously used in these laminations as this will even further improve the oxygen and moisture barrier properties.

The coating of PVDC in five layers in one pass through the coating machine has

been proved to provide protection considerably superior to the same quantity of coating put on in say two layers which is the more usual practice. In fact, Brand Packaging consider that five stage coating on the inside of the laminate is essential to provide the necessary grease and moisture vapour barrier required for the complete protection of dehydrated soups and A.F.D. meals.

However good the protective wrappings for these foods may be in themselves, it is also necessary to have them printed attractively to command attention at the point of sale. Pictorial illustrations of the vegetables and meats, appealingly arranged in striking designs and printed by the rotary gravure process, are of considerable help in this respect. Brand Packaging have a wide range of photogravure machines, capable of printing up to eight colours in line.

This printing capacity is backed up by a modern design and process department which, apart from originating packaging designs with real sales appeal, produces the photogravure engraving on specially balanced cylinders manufactured by the engineering department of the company. Because of such facilities, Brand Packaging Limited claim to be responsible for the manufacture of most of the materials now being used in Great Britain and Ireland for the protection and marketing of dehydrated soups and freeze-dried products.

Automatic Carton Folding and Gluing Machines-Five Types of Carton Produced on a Single Machine

Up to one thousand five hundred cartons per minute can be produced from blanks six inches long (15.24 cm.) on a machine which automatically accepts carton blanks and pre-folds all four creases up to 180°, then glues and counts the cartons at a maximum belt speed of 850 ft. per minute (260 metres/min.). The machine, known as the 'Hunter', is manufactured and marketed throughout the world by *SOAG Machinery Company* of Juxon Street, London S.E. 11.

Although the 'Hunter' is comparatively small and occupies a floor area of only 28 ft. 5¼ ins. × 4 ft. 10 ins. (8.67 m. × 1.47 m.), cartons with interlocking bottoms with double walls, with single walls and certain types of fold-in-carton can all be produced. Short runs are economical because the change-over from one size of carton to another is quickly made by easily accessible hand wheels and screw adjusters. No special tools are needed. Cartons from 1 5/16 in. to 14¾ ins. (33 mm. to 374 mm.) wide and from 2½ ins. to 30 ins. (64 mm. to 762 mm.) long can be produced.

New Design of Machine Deck

The blanks are fed continuously from the bottom of the pile along rubber feed bands to an adjustable micrometer feed gauge, which prevents doubles from entering the machine or leading edges from folding up. The space between cartons is adjustable while the machine is running. Since the main conveyor bands are wide (normally a total of 16 ins.—40.64 cm.), and are made from natural fibre and nylon, they resist wear and do not buckle; consequently, even flimsy and intricate cut-out cartons are positively supported during the folding sequences.

A new type of centre rail construction, which consists of two individually adjustable side plates with rubber rollers set at 2½ in. centres (63.5 mm.), holds the cartons down firmly on either side during folding. The centre rails require no attention since the rollers are located by set screws around which they revolve on self-oiling bushes.

After the final folding operation, cartons pass between pressure rollers, then on to the slow running delivery conveyor. This conveyor has four speeds varied by a simple

lever engagement which adjusts the delivery rate to allow the cartons a longer period of dwell in the pressure section—a particular advantage when using hot glue.

In addition to a totally enclosed, thermostatically controlled glue tank, a single-line glue tank or a double overhead gluing unit can be fitted. An electronic counter records even the smallest cartons running at maximum speed; batches of 25, 50 or 100 are also recorded.

A basically similar but smaller machine, the 'Hawk' has the same performance as the 'Hunter' except that the third crease is only folded to 130° and there is no bottom locking attachment.

Ruddspeed Ltd. Now Introduce a Simple Unit Polythene Bag Maker, Filler, and Sealer

Ruddspeed Limited now introduce an interesting development from their standard UNIVERSAL impulse heat sealing machine.

This takes the form of a simple unit that will pack granular and powdered products into polythene, P.V.C. and other heat sealable types of layflat tubing and seal it at both ends, cut it from the reel and form a convenient sachet type package, its speed of operation being related to that of the operator.

The unit was specifically produced to pack maggots, as used by fishermen, into a handy form of sachet pack.

The method of operation is for the layflat tubing to be indexed from the reel, up through a lower set of sealing jaws, until the leading lip of the filling funnel has entered the tube. The funnel then drops unit its opening is fully within the tube. The top of the tube now lies between the upper set of sealing jaws.

The lower sealing jaws now complete a seal at the base of the 'Bag', cutting it from the reel.

The maggots are then fed through the funnel into the bag. As soon as the bag is full, the funnel and its leading lip are raised clear of the bag, leaving it free for the closing seal by the top set of sealing jaws, ready for removal from the machine.

Completion of this operation then sets the complete cycle in motion again.

Since the maggots tend to stick to one another and so form blocks, a vibrator is attached to the funnel to clear them down and the bag itself is subjected to slight beat agitation as it fills.

These units can be supplied to meet a specific requirement and a limited form of capacity adjustment can be obtained by the use of a narrower or wider form of layflat tubing.

Built-in variable adjustment can be included if required.

Further particulars may be obtained from Ruddspeed Limited, The Aerodrome, Ford, Arundel, Sussex, England.

U.S.A.

Adolph Lomb Medal

Dr C. Kumar N. Patel has been honoured by the Optical Society of America for 'noteworthy contribution' in the field of optics.

The Society presented its Adolph Lomb Medal at its 50th anniversary meeting held in Washington on March 17.

The Medal is awarded once every two years to a person under 30 years of age. Dr Patel, 27, is the 14th recipient.

In making the award, the Optical Society noted that 'Dr Patel's theoretical and experimental contributions to the gas Lasers are equalled by very few scientists regardless of age'.

Dr Patel is noted particularly for his part in the discovery of more than 200 Laser transitions encompassing approximately

12 different gas compositions. The word Laser is made up of the initial letters in a phrase that describes the device's function —'Light Amplification by Stimulated Emission of Radiation'.

In simple terms, the function of a Laser is to amplify normal light and transform it into a narrow intense beam. This makes it possible to use light in much the same way as radio, radar or television waves.

Laser technique frees optics of many of its former limitations, making light beams a million times as pure, as intense and as easy to focus.

Born in Baramati, Maharashtra, Dr Patel graduated from the College of Engineering of Poona University in 1958 with the Bachelor of Engineering degree in telecommunications.

As the top student in his graduating class, he was awarded the Ranade Prize.

From 1958 to 1961, he attended Stanford University, California, where he received his master's degree and doctorate in electrical engineering.

While at Stanford, Dr Patel conducted research on narrow bandpass ferrimagnetic filters. He joined the Bell Telephone Laboratories in 1961.

Since then, he has discovered a number of Laser systems, and explored various mechanisms of gas Laser excitation and non-linear optical phenomena.

Several months ago, Dr Patel invented flowing gas Laser which for the first time utilised the transfer of vibrational energy of molecules to obtain what was then the highest continuous power output at infrared frequencies and the highest energy conversion efficiency of the Laser.

Chickens for Poona

Nearly 4,000 chickens of a very sturdy strain were flown into Bombay from the United States. On arrival in Bombay on March 16, the chickens were trucked immediately to Arbor Acres Farm in Talegaon, near Poona.

Known as Arbor Acres Browns, these chicks gave the first evidence of their sturdiness when found in perfect condition on arrival in Bombay after a delay of nearly 18 hours *en route*.

Such a delay for a weaker strain could have been fatal to young chicks of other strains.

The Arbor Acres Browns have developed in the United States by crossing the Rhode Island Reds rooster and the Plymouth Rock hen. The new breed have been found to be especially disease-resistant to all kinds of poultry diseases.

The Arbor Acres Farm in Talegaon was established in India in collaboration with Arbor Acres of United States, a well-known firm of poultry breeders. The United States Government has loaned Rs 25 lakhs to the Talegaon farm under the Cooley Amendment of Public Law 480.

ITALY

Import of Bananas

Till the 31st December, 1964, the import of bananas into Italy was vested in the State Monopoly for Bananas. On 1st January, 1965, the State Monopoly was abolished and the banana trade was reverted to private hands. For the year 1965, specific quotas were introduced by the Italian Government for different areas/countries. For the year 1966, the Italian Government has announced a global quota of 300,000 tons without area/country-wise quota restrictions. The quota, which will be utilized by 'Customs Control' (that means imports will be free till the whole of the quota fixed is used) has been divided into 6 bi-monthly quotas of 45,000 tons, 57,000 tons, 57,000 tons, 45,000 tons, 51,000 tons and 45,000 tons.

SPAIN

Schedule of the soft drinks regulation

Classification	Soft drinks, containing fruit juice		Soft drinks, not containing fruit juice	
Example Denomination of soft drink ...	Nectare de fresas	Bebida de Zumos de frutas	Bebida de extractos	Gaseosa o soda
Example additions ...	Nectare de fresa	Refresco de zumo uva	Cola, Agua tonica	Gaseosa de limon Soda de naranja
Fruit Juice				
Grape ...	min. 40–60 %	min. 22 %		
Apple ...	min. 40–60 %	min. 16 %		
Apricot ...	min. 40–60 %	min. 16 %		
Strawberry ...	min. 40–60 %	min. 6 %	+	+
Pineapple ...	min. 40–60 %	min. 6 %		
Raspberry ...	min. 40–60 %	min. 6 %		
Black Currant ...	min. 40–60 %	min. 6 %		
Citrus ...	min. 40–60 %	min. 8 %		
Flavour				
(*a*) Natural: obtained from natural products ...	—	+	+	+
(*b*) Fruit extracts, fruit crush ...	±	+	+	+
(*c*) Artificial: identical to those found in nature ...	—	—	—	+
(*d*) Artificial: not found in nature ...	—	—	—	—
Sweetening Matter				
(*a*) Sugar ...	+*	++	+	+
(*b*) Corn syrup ...	+*	±	±	±
(*c*) Permitted artificial sweetening matter ...	—	—	—	+*
Acid				
(*a*) Organic: Citric acid	—	+	+	+
(*a*) Organic: Tartaric acid	—	+	+	+
(*a*) Organic: Lactic acid	—	+	+	+
(*a*) Organic: Carbonic acid	±	+	++	++
(*a*) Organic: Ascorbic acid	—	±	±	±
(*b*) Mineral: Phosphoric acid	—	±	+	+
Preservative				
Sulphurous acid or ...	—	Max. 350 mg./l		Max. 70 mg./l
Benzoic acid or ...	Max. 1000 mg./l*	Max. 600 mg./l		Max. 120 mg./l
Sorbic acid ...	Max. 1000 mg./l*	Max. 600 mg./l		Max. 120 mg./l
Formic acid ...	—	—		—
Foaming agent				
Saponins ...	—	—	—	—
Others ...	—	—	—	—
Clouding agent				
Bromine containing ...	—	—	±	±
Free from bromine ...	—	—	+	+

Classification	Soft drinks, containing fruit juice		Soft drinks, not containing fruit juice	
Permitted colour ...	−	+	+	+
Caffeine ...	−	−	±	±
Quinine sulfate (calculated as quinine) ...	−	−	Max. 83 p.p.m.	±
Labelling				
Word suggestive of fruit ...	+	+ 'Refresco'*	±	+ 'Gaseosa'*
Pictorial device ...	+	+ 'Refresco'*	−	−

++ Obligatory
+ allowed (not obligatory)
− Prohibited
± not regulated
* with declaration.

Naarden News, January 1966

FRANCE

Exhibition at Paris

A society organises every year at Porte de Versailles an exhibition cum sale of a certain selected range of goods from a large number of countries. Most of the diplomatic missions in France extend their patronage and co-operation to make the exhibition a success. Indian Embassy at Paris also propose to arrange next year supply of canned fruits, sea-foods, cashew nuts, sports goods etc. through the courtesy of the various Indian Export Promotion Councils. Interested parties may contact the Indian Embassy at Paris for detailed particulars in the matter.

SYRIA

Developments Affecting Imports: Banana

Although Syria abounds in several other varieties of fruit, it does not grow Bananas. Being a scarce item, the Syrians consider banana as a choice fruit and the country imports them in large quantities from neighbouring Arab countries, namely, Lebanon, Jordan and Sudan. In 1963, Syria imported 9,790 tons of banana worth 3,980,000 Syrian Pounds. Lebanon was the chief supplier with a supply of bananas worth 3,569,000 Syrian Pounds.

When imported from Arab countries, banana as well as many other agricultural products are exempted from Customs duties. Otherwise, it is subjected to a minimum duty of about 47 per cent *ad valorem.* Since the Arab countries also have the advantage of proximity to Syria, it saves them considerably on freight charges.

In these circumstances, prospects of import of banana from India into Syria are not normally considered encouraging. This year, however, due to failure of banana crop in Lebanon and Jordan, the local importers have been compelled to tap other sources of supply, including India.

It is reported that this mission was approached in this regard by a certain Syrian firm for putting them in touch with reliable exporters of Indian banana. The party expressed desire to import 5,000 tons of

round green banana, weighing about 8 to 12 bananas per kilo, similar to those exported by India to Kuwait in weekly shipments of 300 tons.

AUSTRALIA

Beeswax Exports

Exports of Australian beeswax rose by 50,000 lbs. to a total of 211,000 lbs. in the year to June 30, 1965, compared with the previous 12 months.

Australian honey exports in the 12 months to June 30 last totalled 13,660,000 lbs. valued at £A 711,000 ($ A 1,422,000).

Britain was the biggest buyer of Australian honey during this period, taking 7,945,000 lbs. worth £ A 376,000 ($ A 752,000).

Milk Crystals—Something new from Australia

Newly-developed Australian-produced dried full cream milk crystals are finding a ready market in South East Asia. Hong Kong, Singapore, Taiwan and Thailand have imported tons of the new product. The manufacturing company claims the crystals are the most advanced and convenient form of dried milk. The crystals dissolve in water in 15 seconds to make full cream milk in every way equal to fresh milk. The crystals are packed in multi-wall, poly-lined bags to retain quality and freshness.

The company also makes anhydrous full cream milk powder for regular household use, anhydrous milk fat, or as it is more commonly known, butter oil, and non-fat milk crystals and powder—a high protein, low calorie dried milk product. Skim milk powder is another of the company's products.

All products are made at Grafton and Tareo, New South Wales, in one of Australia's richest dairying areas. The powder processing plant is one of the largest of its kind in the world.

Consumption of milk is increasing in Asian countries, especially for the feeding of infants and invalids.

Malaysians are consuming more than three million lbs. of Australian full cream milk and more than 620,000 lbs. of skim milk a year. In Taiwan, annual consumption of Australian full cream milk is about one million lbs. Hong Kong and Thailand together import about one million lbs.

ETHIOPIA

Fruits fresh and Nuts

Considerable quantity of fresh fruits and nuts is imported annually. Imports in 1964 amounted to 1,333 tons approximately valued at Eth. $457,295 (1 Eth. $=Rs 1.89). Major supplying countries are Italy, Israel, Iraq and Sudan. India's share in this item in 1964 was as low as 475 Kgs. valued at Eth. $225 only. There is a considerable scope of increasing India's share in this item especially in fruits like mangoes, cherry, *chikkus*, etc.

Dried Fruits

Imports of dried fruits into Ethiopia in 1964 amounted to 1,366 tons valued at Eth. $550,976 (Approximately Rs 11 lakhs). Cyprus, Italy, Iraq and Greece were the major suppliers to Ethiopia. India's share amounted to 20,524 Kgs. valued at Eth. $8,183.

Indian Trade Journal

CONGO

New Regulations Concerning Visitors to the Democratic Republic of the Congo (Leopoldville)

New Regulations have recently been brought into operation relating to visitors to the Congo.

All persons entering the Congo must have a visa. Those entering with a 'visa de voyage' are obliged to exchange for Congolese francs, the equivalent of 20 US dollars per day at the Bureau de Change at the point of entry into the Congo. They are then given a visa valid for the number of days for which they have paid, e.g. if they change 60 US dollars into 9,000 Congolese francs, they are allowed to stay for three days.

An airport embarkation tax of 300 Congolese francs per person has also been instigated. *Board of Trade Journal*

TANZANIA

Cloves

The Zanzibar Government decided to take over the clove trade and to buy all cloves from growers and forbid merchants to trade in cloves. All cloves in Pemba are already bought by the Zanzibar State Trading Corporation. Previously merchants used to buy cloves from the growers and re-sell to the State Trading Corporation or to the shippers. The prices ranged from Shs. 90 to 91 during the month and 531,410 lbs. were exported, Indonesia taking the major lot of 336,000 lbs.

TRADE MARKS

Trade Marks accepted by the Trade Marks Registry

Name and address of Applicant	No. and Date of the Journal publishing the Trade Mark	Official No. of Trade Mark	Date	Products	Trade Mark
M/s. P. Vencatachellum Condiments, No. 1, Broadway, Madras-1	401 16-2-1966	227,709	11-3-1965	Marmalades, Jam and Jellies Pickles	P. VENCA-TACHEL-LUM
M/s. Unilver Limited Port Sunlight, Cheshire, England	401 16-2-1966	229,146B	27-5-1965	Soup	ROYCO
,,	401 16-2-1966	230,732	11-8-1965	Edible oils and fats, milk and other dairy products, preserved, dried and cooked fruits and vegetables, mayonnaise	BETIX
,,	401 16-2-1966	230,733	11-8-1965	,,	ETAX
M/s. Canada Dry Corporation, 100, Park Avenue, New York, U.S.A.	401 16-2-1966	230,128	15-7-1965	Non-alcoholic, non-cereal, maltless, carbonated beverages and syrups and extracts	WINK
M/s. Merwanjee Poonjiaje & Sons Pvt. Ltd., Princess Dock, Frere Road, Bombay-29	402 1-3-1966	224,749	7-10-1964	Flour and preparations made from cereals, baking powder, salt, mustard, pepper, vinegar, sauces, spices	KNIGHTS
M/s. P. Vencatachellum Condiments, No. 1 Broadway, Madras-1	402 1-3-1966	227,716	11-3-1965	Curry powders, sauces, ketchup, pepper water pastes etc.	P.V.
M/s. The Gorton Corporation 327, Main Street, Gloucester, Massachussets, U.S.A.	403 16-3-1966	216,377B	5-7-1963	Canned fish and shellfish, salt fish and frozen fish and shellfish, prepared seafoods, canned and frozen frog legs etc.	FRESH-LOCK
Dr. Sant Singh & Sons, (Aujolo Chemical Works, Atlas House, Industrial Estate, Hadapsar, Poona-1	403 16-3-1966	226,224	28-12-1964	Aerated drinks, aerated waters, carbonated beverages and waters	VITOLA
M/s. Manila Soft Drinks, 115/C, Prince Golam Husain Shah Road, Calcutta-32	403 16-3-1966	230,980	26-8-1965	Aerated waters and non-alcoholic fruit juice included in class 32	HULALA
M/s. Pax Beverages Company, Pax House, 50 Sivan East Car St., Palayamkottai, Tirunelveli-2	403 16-3-1966	230,942	24-8-1965	Aerated waters, fruit squashes, fruit cordials and syrups for making beverages	PAX

Government Notifications

- *Sugar (Control) Amendment Order, 1966*
- *Export of Frog Legs (Inspection) Rules, 1965*
- *Export of Bananas*

Sugar (Control) Amendment Order, 1966

The following Notification [G.S.R. 210 (No. 1(1)/63-S. Py) dated the 5th February, 1966] has been issued by the Government of India in the Ministry of Food and Agriculture (Department of Food):

In exercise of the powers conferred by sub-rule (2) of rule 125 of the Defence of India Rules, 1962, the Central Government hereby makes the following Order further to amend the Sugar (Control) Order, 1963, namely:

1. This Order may be called the Sugar (Control) Amendment Order, 1966
2. In the Sugar (Control) Order, 1963, in clause 6, for sub-clause (2) the following sub-clause shall be substituted, namely:

'(2) Such price or maximum price shall be fixed having regard to the estimated cost of production of sugar determined on the basis of the relevant Schedule of Cost given in the Report of the Sugar Enquiry Commission (October, 1965), subject to the adjustment of such rise in cost subsequent to the Report aforesaid as in the opinion of the Central Government cannot be absorbed by the provision for contingencies in the relevant Schedule to that Report'.

Export of Frog Legs (Inspection) Rules, 1965

The following Notification [S.O. 491 (N. 60/102 EXP. INSP/65)] dated the 11th February, 1966] has been issued by the Government of India in the Ministry of Commerce:

In exercise of the powers conferred by Section 6 of the Export (Quality Control and Inspection) Act, 1963 (22 of 1963), and after previous publication as required by sub-rule (2) or rule 11 of the Export (Quality Control and Inspection) Rules, 1964, the Central Government hereby:

(1) notifies that frog legs shall be subject to quality control and inspection prior to export;

(2) specifies the type of inspection in accordance with the Export of Frog Legs (Inspection) Rules, 1965, as the type of inspection which would be applied to such frog legs prior to their export;

(3) recognises the specifications as set out in the Schedule annexed to this Notification as the standard specifications for frog legs; and

(4) prohibits the export in the course of international trade of frog legs unless the same is accompanied by a certificate issued by the Director, Central Institute of Fisheries Technology, Ernakulam, or (*a*) any other Officer of that Institute; or (*b*) any Officer of any of the Government Technological Laboratories situated at the ports of export, authorised in this behalf by the aforesaid Director, to the effect that the frog legs conform to the specifications as set out in the said Schedule.

2. This Notification shall come into force on 1st March, 1966.

THE SCHEDULE

Specifications for Frog Legs

1. The frog legs shall be of three types namely, creamy white or light pink, brown and blue.
2. The frog legs shall be either wrapped individually in polyethylene film or other suitable covering or frozen blocks.
3. The frog legs shall be completely free from skin and any foreign matter. They shall be well trimmed, shall be reasonably free from blood clots and shall not have black discolouration due to spoilage.
4. The frog legs shall not show any signs of spoilage and shall not have any off-odour when thawed and they shall have a soft and firm texture.
5. The drained weight of the frog legs packed in any given container shall be not less than that declared on such containers.
6. The frog legs packed in a container shall be uniform in size and the size count of the frog legs shall confirm to that declared on the container.

Export of Frog Legs (Inspection) Rules, 1965: Panel of Export Constituted for Hearing Appeals

The following Notification [S.O. 492 (No. 60/102 EXP. INSP/65)] dated the 11th February, 1966] has been issued by the Government of India in the Ministry of Commerce:

In pursuance of rule 6 of the Export of Frog Legs (Inspection) Rules, 1965, the Central Government hereby appoints the persons mentioned below as the panel of exports for the purpose of hearing appeals under that rule, namely:

1. The Chairman, Marine Products Export Promotion Council;
2. The Director, Central Institute of Fisheries Technology;
3. The Director of Fisheries, Government of Kerala;
4. The Director of Fisheries, Bombay;
5. The Director of Fisheries, Mysore;
6. The President of Sea Food Canners' and Freezers' Association of India, Cochin; and
7. One member nominated by the Chairman, Marine Products Export Promotion Council from among the members of the Sea Food Canners' and Freezers' Association of India, Cochin.

2. The Chairman, Marine Products Export Promotion Council shall be the convener of the panel.

3. The quorum of the panel shall be three.

Export of Bananas

The following Trade Notice (No. G-13/66, dated the 28th January, 1966) has been issued by the Joint Chief Controller of Imports and Exports, Calcutta:

It is notified for information of the trade that in super-session of all previous instructions on the subject, export of bananas will hereafter be allowed as shown below:

(*a*) All permissible destinations excluding destinations in Persian Gulf-Export will be licenced freely by all category of shippers.

(*b*) Destinations in Persian Gulf—Export will be allowed only by the two category of shippers mentioned below:

(*i*) In the States of Maharashtra and Gujarat, export will be allowed by the Maharashtra State Co-operative

Marketing Society Ltd., Bombay, and the Gujarat State Co-operative Fruit and Vegetable Marketing Federation Ltd., Bardoli, Dist. Surat, respectively.

(*ii*) Established shippers will be allotted quotas on the basis of 12½ per cent of the exports made in the year ending 30th June, 1961. Repeat quotas will be allotted to such of the established shippers who have actually exported their entire quota on the basis of 12½ per cent of the exports made in the year ending 30th June, 1961.

2. In this connection, it is emphasized that the export of bananas to Persian Gulf destinations will not be allowed by anyone except the two category of shippers mentioned above.

3. The policy will remain in force until further orders.

Men and Companies

MR G. S. LITTLE JOHN



The 1965 Kashalkar Memorial Award was presented by Mr B. P. Chaliha, the Chief Minister of Assam, to Mr G. S. Little John, Research Manager, The Metal Box Company of India Ltd., during the inauguration of the Annual Conference of the All India Food Preservers' Association, which was held in Shillong on 5th March, 1966. This award is made annually for services to the food preservation industry.

A graduate of Aberdeen University, Mr Little John started his career in 1950 as Works Chemist with W. A. Baxter & Sons Ltd., Fochabers, Scotland, a company which exports canned fruits, preserves, pickles, vegetables and speciality meat packs. Two years later, he joined R. D. Waddell Ltd., Glasgow, as Chief Chemist and was responsible for recipe formulation and product quality of the company's range of fresh, frozen, cured and canned meat, canned fruits, bakery products and fats.

Being interested in packaging research, Mr Little John joined the Research Department of the Metal Box Company Ltd., London, in 1956 and 12 months later came to India on a two-year assignment as Canning Adviser to the Metal Box Company of India Ltd. During this period, Mr Little John toured India extensively studying the problems of the industry and forming a Canning Advisory Service.

In 1960, Mr Little John became Head of the Metal Box Company's Research Department in Calcutta, heading a team of scientists engaged on all aspects of packaging, including food technology; plastics, paper and board; metallurgy; lacquer and printing ink development; and general package evaluation. He has studied food packaging extensively in Britain, America, Africa and Australia.

He is a Member of a number of I.S.I. Committees; a Member and past Vice-President of the Association of Food Technologists (India); a Fellow of the Royal Society of Health (U.K.); a Member of the Institute of Packaging (U.K.); a Member of the Institute of Food Technologists (U.S.A.) and a Fellow of the Institute of Food Science and Technology (U.K.).

* * *

Shri P. R. Bengali, M.D.O. (F.P.), Lucknow, has been promoted as Dy. S.M. D.O. (F.P.) with effect from 21.2.1966. Shri K. P. Ganguly, Dy. S.M.D.O. (F.P.), Calcutta, has retired. Shri H. S. Jayadeviah,

Dy. M.D.O. (F.P.), Amritsar, has been transferred to Cochin.

The following Senior Inspectors (F.P.) have been promoted as Dy. Marketing Development Officers (F.P.) at the stations mentioned against each.

1.	Shri B. D. Dongre	Nagpur
2.	,, Y. S. Bangera	Bombay
3.	,, K. C. Viramani	Amritsar
4.	,, G. S. Tiwari	Nagpur
5.	,, N. D. Sharda	Calcutta
6.	Ku. R. Sushila	Madras

Statement about ownership and other particulars about newspaper INDIAN FOOD PACKER to be published in the first issue every year after last day of February.

FORM IV (See Rule 8)

1. Place of Publication	Bangalore
2. Periodicity of the Publication	Once in two months (Bi-monthly)
3. Printer's Name	Shri K. A. Korula
Nationality	Indian
Address	Wesley Press, Mysore–1
4. Publisher's name	Shri V. B. Oberoi
Nationality	Indian
Address	C/o Kissan Products Limited, Old Madras Road, Bangalore–16.
5. Editor's Name	Shri V. B. Oberoi
Nationality	Indian
Address	C/o Kissan Products Ltd., Old Madras Road, Bangalore–16.
6. Names and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital.	The Indian Food Packer is the official organ of the All India Food Preservers' Association, 8-B, Chakraberia Lane, Calcutta–20.

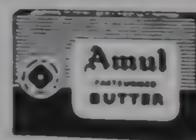
I, V. B. Oberoi, hereby declare that the particulars given above are true to the best of my knowledge and belief.

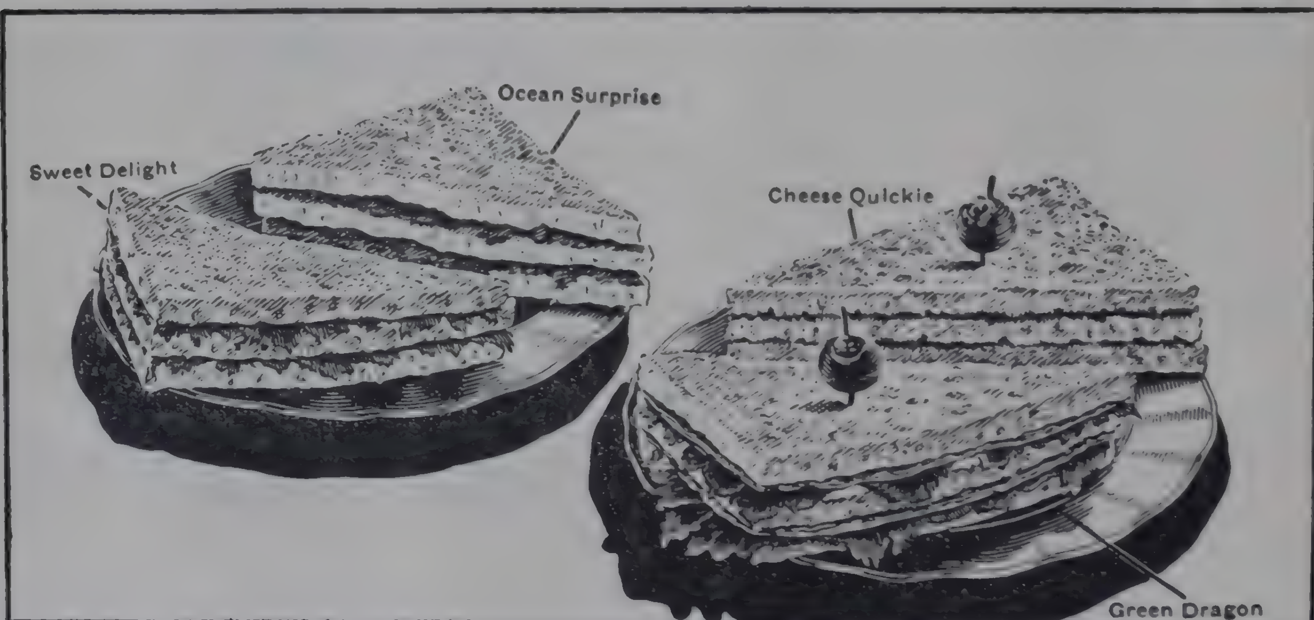
V. B. OBEROI
Signature of Publisher

PRINTED IN INDIA BY K. A. KORULA AT THE WESLEY PRESS, MYSORE CITY



Amul Butters Up A Tasty Spread...





Bread and Amul Butter and sandwiches with Amul Butter are one of the most nourishing and tasty ways in which you can give your family the goodness of energy giving Sunshine Vitamins A & D. Pure fresh cream Amul Butter is dairy churned into golden yellow butter slabs in just five hours from milk pail to butter packet—retaining all the freshness so good for you.

Dairy Fresh... Pure Cream...

Amul BUTTER

AMUL adds the priceless extra of nourishing goodness to all your food.

A KAIRA CO-OP PRODUCT—PRICELESS KAIRA DISTRICT CO-OPERATIVE MILK PRODUCERS' UNION LTD., ANAND.

CAS/KMP-34



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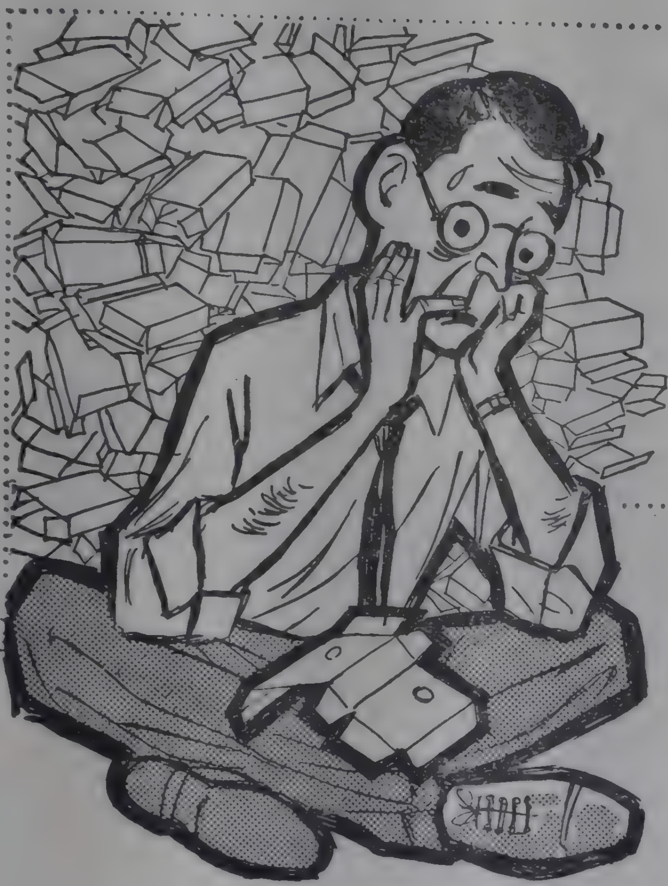


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6






Coca-Cola





Fruits: Pears, Peaches, Cherries, Strawberries, Fruit Cocktail, Victoria Plum, Greenage, etc. **Vegetables:** aragus, Saurkraut, Baked Beans, Dil Cherkins, Gardenpeas, Mixed Vegetable, etc. **Soups:** Tomato, Vegetable, ry, Mushroom, Pea, etc. **Jams:** Strawberry, Raspberry, Redcherry, Apricot, Pineapple, Mixed Fruit, etc. **ashes:** Orange, Lemon, Mango, Pineapple, etc.

And also Sauces, Jelly Crystals, Peanutbutter, Pearl Onion, Salmons, etc.

Manufacturers:

TULIP PRODUCTS COMPANY

CALCUTTA AND SRINAGAR (Kashmir)





this is Italic Italic is very easy to read.